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EDITORIAL NOTES

THE FUTURE GAS INDUSTRY

WE begin in our issue to-day publication of our report of the discussion on the Symposium of nine short Papers on "The Gas Industry: 1941 and After," presented at the Institution meeting on June 11 and given in full in our pages last week. The theme of three of the Papers comprising the Symposium was a plea for a far greater measure of standardization—not rigid standardization tending perhaps to retard progress and development, but rather standardization characterized by reasonable flexibility and aiming at the maintenance of a high standard of gas service in relation to the times, present and future, and the elimination of what would seem to us—and has, in fact, seemed to us for a long time—quite unnecessary waste of labour and money. Sir Frederick West dealt with the standardization of calorific value, Mr. W. L. Boon with the standardization of coke grades and properties, Mr. R. J. Rogers with the standardization of consumers' appliances. And we think we might also add another contribution to this category—that of Dr. Harold Hartley on one particular aspect of a standard gas, one free from sulphur.

The story of attempted standardization is not one of the brightest commentaries on the Gas Industry's activities and on the Industry's vision. It is, to our mind, a somewhat sorry tale of ineffectualness, and our hope is that this wartime meeting of the Institution—a meeting so bright and alive—will at very long last prove a stepping-off ground for action. For the portents are plainly there to see. There is first the possible setting-up of a Ministry of Fuel and Power; there is the fact that after the war the public will not have fat bank balances; there is also the fact that gas consumers—indeed, fuel consumers generally—have for the most part been given a service which they will again expect and which must become better in many respects with the passage of time in a renewed peace period. Let us take for the moment the first-mentioned aspect of standardization—calorific value, and let us take a glance at history. The last adjective which could properly be applied to this subject and its discussion is "new."

Indeed, concerning calorific value, Sir Frederick West was the first to admit it in his Paper, which succinctly outlined what had been pointed out and suggested—and what had not happened. The present war has shaken us and our belongings up in more ways than one. It is to be hoped that it will shake-up the Gas Industry into more efforts to effect more standardization and more cohesion and firmer direction. If this proves a pious hope, the Industry is bound to suffer.

Shortly after the last war, in April of 1919, we had the following comment to make on the report for that year of the Fuel Research Board. "It seems desirable that before any legislation is undertaken the representatives of consumers, producers, and makers of fittings and burners should jointly decide on the standardization of burners and appliances for a limited number of calorific values." Since that time we have referred to the matter on more occasions than we should care to count—and in any case to do so would only be a waste of time. Through the passage of the past twenty years or so there has been a sort of undercurrent of suggestion regarding standardization of calorific value, enlightened every now and then by what were really quite startling analyses. Analyses, unfortunately, which brought little result commensurate with their importance. In 1924 the allocation of calorific value was shown by Sir James Ferguson Bell in his Presidential Address to the Institution. In 1937, in a Paper to the Institution, Mr. E. G. Stewart quoted the figures given and compared them with the position in 1936. He showed that in that year less than 1.1% of total gas sales was above 500 B.Th.U., apart from the South Metropolitan Gas Company and the South Suburban Gas Company. The value of 500 covered 39% of sales; the range 470–480, 28%; the range 450–460, 21%. Below 450 comprised only 4% of sales. Yet there were 28 different declared calorific values, so, said Mr. Stewart optimistically: "It would not seem out of place, therefore, to expect that *in the near future* [our italics] unlimited choice in calorific values will give place to a few standardized values throughout the country, such as 350, 450, 475, 500, and 540." These five, he pointed out, would be suitable for any combinations of existing or contemplated means of gas production, while the middle three alone should be acceptable to makers of 90% of the total gas sold. At the 1937 meeting Dr. Hartley expressed the hope—and he was thinking in terms of those concerned with making appliances, that three, not five, calorific values would be decided upon.

In his Paper this month Sir Frederick West brought the figures in accordance with the Board of Trade Return for 1938—the latest available official statistics. He pointed out that the declarations, which ranged from 200 to 600 B.Th.U., numbered no fewer than 26, and he asked, Why this diversity? He followed by referring to Mr. T. C. Finlayson's comment in the discussion on Mr. Stewart's Paper that the trend of 450, 475, and 500 B.Th.U. gas was "logical and progressive," and to the suggestion made in the report of P.E.P. to the Gas Industry that these three values should suffice to meet all the different conditions encountered in this country. Sir Frederick, having conceded that one standard calorific value for the whole country "is inadvisable though in many respects desirable, there appears to be a very strong case for a limited number of standards;" and he recommended four values—viz., 500, 475, 450, and 425. We quite agree that one standard calorific value is inadvisable, for a number of reasons, including variations in types of coal and carbonizing plant, the coke market, capacity of mains and storage, and benzole extraction. But, as we have said so many times before, the divergence which still prevails is more than difficult to understand, and does not speak well for cohesion within the Industry. We quote again Dr. E. W. Smith's terse query at the Institution meeting—"What are we going to do about it?" We fully appreciate that calorific value is one factor only affecting the combustion of gas at the burner. The influence of variations in density, chemical composition, flame velocity, is of great importance and has, in fact, been studied intensively during recent years. Nevertheless, standard calorific values would do much to mitigate many evils and would undoubtedly help the manufacturers of appliances, besides making regional intercommunication of gas supply a practical proposition.

RATING ASSESSMENTS IN WARTIME

THE Rating and Valuation Act, 1925, conferred upon rating authorities and ratepayers alike the right to make at any time a proposal for the amendment of the current Valuation List. The number of such proposals which have been made in recent months is due to the postponement of the quinquennial period and, to an even greater extent to the vast changes in conditions which have resulted from the war. The right of public utility undertakings to be assessed for rates on the basis of their receipts and profits was finally established by the House of Lords in 1926 in the well-known and often cited case of the Metropolitan Water Board *v.* the Kingston Union Assessment Committee. The House of Lords did not, however, impose the profits principle as a cast-iron rule, but as Lord Cave stated in his Judgment " he did not mean that in no case could another method be adopted in assessing water works, but in order to justify that course it would be necessary that the authority should be satisfied that there were special circumstances sufficient to make it necessary to exclude the recognized formula."

Circumstances arising from the war have brought before the Courts the much discussed problem whether the fact that the profits principle might result in a *nil* return would be a special circumstance sufficient to justify a departure from the recognized formula. This question was settled by the Judgment of the Court of Appeal delivered in July, 1940, in the case of the Barking Borough Rating Authority *v.* the Central Electricity Board. It was held in that case that the fact that the Central Electricity Board was precluded from making a profit, and that an assessment on the profits basis would give a *nil* return, did not constitute special circumstances which justified a departure from the profits basis of assessment. It is to be noted, however, that without prejudice to the legal position, the Board voluntarily accepted the assessment imposed by the Assessment Committee and presumably paid rates on that basis.

This case, however, only solved one question to raise another. Certain remarks of Mr. Justice Hilbery in the Divisional Court were interpreted by many Rating Surveyors to imply that, although a proposal to amend a valuation list could be made at any time, such a proposal could only be supported by evidence which was available at the date of the making of the rate. According to this theory, a public utility in a district where the rate was made in April could not, for instance, support a proposal made in November by producing a balance sheet published in June. If such a contention was correct it would go far to stultify the right conferred by the 1925 Act to make a proposal at any time. Many gas undertakings which naturally desired to obtain a reduction of their assessments as soon as their annual accounts became available have been puzzled by the legal disputes proceeding between the rating experts in this vital matter. Fortunately the disputes have been satisfactorily settled by the Judgment of the Divisional Court in the case of Barrett and Russells Gravesend Brewery, Ltd., *v.* Gravesend Assessment Committee—fully reported in Vol. XXXIV, No. 895, of Rating and Income Tax. This case has clearly established that any evidence which is available at the date of the making of the proposal may be offered and accepted in support of the proposal.

Thus in the case given as an illustration above, the accounts may be placed before the Court to support the proposal made in November, notwithstanding the fact that those accounts were not published at the date of the making of the rate in April. Conversely, the proposal could not be supported by evidence which has become available only after the date upon which it was made. The advantage to gas undertakings of this clarification of the law, particularly in cases where war conditions have led to a serious decline in receipts and profits, is obvious.

Another recent decision of the High Court on a kindred matter is also of interest with regard to the form of the proposal. It may be remembered that in 1939 the Divisional Court stated in the case of Rex *v.* Thanet Assessment Committee that the proposal made by the rating authority is respect of the Isle of Thanet Gas Company was void in that it was too vague. The Court said, in effect, that a proposal must give a sufficient indication as to whether it is proposed to revise the assessment in an upward or downward direction. A mere proposal to vary an assessment "in such a manner as may be justified by the accounts" is insufficient and invalid. The Thanet case was cited in the recent case of Rex *v.* Heston and Isleworth Borough Council, 57 T.L.R., 569, and the Divisional Court, while affirming the same principle, held that it is not necessary to the validity of a proposal to amend the valuation list that the person making the proposal should state the actual amount to which he wishes the assessment complained of to be reduced or increased.

To summarize the effect of various cases which we have mentioned, the present position appears to be as follows: Where undertakings have been prejudicially affected by war conditions, they may make a proposal for the reduction of their rateable value at any time notwithstanding the fact that the evidence upon which they propose to base their proposal was not available at the making of the rate. Further, the fact that their profits have so fallen as to justify a *nil* return for rating purposes is no excuse for a departure from the profits principle. Whether in such a case it would be wise in practice, whatever the theory may be, to push the profits principle to its logical conclusion, is one of policy which would, no doubt, be considered in each particular case. If the gas undertakings succeed in obtaining a reduction of their rateable value, that reduction goes back to the date of the making of the rate, which is normally in April. It has been contended that this is unfair, particularly in so far as the proposal may have been based upon evidence which was not available in April. The High Court has, however, dealt with this contention and has pointed out that the rating authority has no just cause for grievance in so far as the effect of war conditions are gradual and must have been in operation at the date of the making of the rate, notwithstanding the fact that the evidence upon which the reduction of the rateable value is based was not available until a later date.

Institute of Fuel Students' Medal

To encourage the preparation of Papers by students of Fuel Technology, the Council of the Institute of Fuel have decided to make an annual award of a Medal, together with a prize consisting of books and/or instruments to the value of £5. The Rules governing the award of this prize and Medal are as follows:

The student must be under 25 years of age of any University or Technical College in the United Kingdom.

The Paper shall deal with some subject relating to the preparation or utilization of fuel, or allied subjects. While the student is left free to choose his own subject if he so desires, the following subjects are suggested as a guide to his choice: (*a*) Discuss the industrial use of any two of the following gases: Town gas, coke oven gas, producer gas, blast furnace gas, water gas, natural gas. (*b*) The trend of development in high or low temperature carbonization of coal. (*c*) What is our present knowledge about the spceific heat and heat conductivity of coal and coke? (*d*) The principles of screening. (*e*) Discuss the factors influencing the efficient blending of solid fuels. (*f*) The fundamental principles influencing the segregation of coal in bunkers when filling or discharging. (*g*) The possible developments in the use of petroleum gases.

Papers must be submitted to the Secretary of the Institute under a *nom de plume*, the name and address of the author being enclosed in a sealed envelope and sent with the Paper. Papers must be received by the Secretary on or before Sept. 1 in any year.

Papers must be limited to a maximum of 6,000 words and may be illustrated by line drawings or photographs.

In judging the Papers submitted, consideration will be given to: (*a*) Subject matter. (*b*) Evidence of analytical power and logic. (*c*) Construction of Paper in so far as it gives evidence of an orderly mind and shows continuity of argument with an orderly development of the theme. (*d*) English.

Keith Blackman, Ltd.

A net profit of £38,414, against £32,770, is recorded in the report of Keith Blackman, Ltd., for the year ended March 31, and the dividend on the Ordinary Shares is 17½% compared with 15½% last year. To fill the vacancy caused by the death last December of Mr. J. W. Hamsheir, Mr. W. B. Richards, who served as Technical Manager in association with Mr. Hampsheir, has been appointed General Manager. Mr. M. Burningham has become Financial Manager while still carrying on the duties of Secretary, and Mr. D. M. Brown, who has been in charge of the ventilating department for many years, has been made Assistant Manager. The Directors are showing their appreciation of the loyal and devoted service of the employees, at times in trying and dangerous circumstances, by granting them a bonus in accordance with their usual practice.

Gas Equipment at Feeding Centre

A Communal Feeding Centre known as the Churchill Restaurant has recently been completed by the Oldham Education Authority. The whole of the equipment for this Centre was provided by Messrs. James Stott & Co. (Engineers), Ltd. It consists of cooking ranges, roasting ovens, frying range, boiling table, hotcupboards, bain maries, tea-making plant, washing-up and vegetable preparation sinks, water heaters, potato peeling machines, slicing machines, mixing machines, refrigerator, and crockery trolleys.

The Centre has proved extremely popular with the townspeople and has amply justified its installation. The premises are part of an existing school which has been converted for the purpose of communal catering.

South Midlands Hotel Adopts Gas

The proprietors of one of the best known hotels in the South Midlands recently decided to replace (with one small exception) the whole of their solid fuel kitchen equipment with gas apparatus. The following Radiation appliances were installed: One four-oven "Grosvenor" central solid top range, with ovens 24 in. wide, three externally heated and one semi-externally heated and regulo-controlled. At one end of the range there is a "Warrington" type hotcloset with open bain marie. The range is complete with central potrack. One 1340 vegetable and pudding steamer. All of the appliances were of the most up-to-date design, and finished in "Radar" porcelain enamel. It is understood that the whole installation is giving most satisfactory service.

Prefabricated Nursery Schools

A model of the first prefabricated Emergency Nursery School to be erected in this country was presented recently by Gyproc Products to Lady Allen of Hurtwood for the Nursery School Association and was inspected by the Rt. Hon. Ernest Brown, M.P., at a private showing at the Royal Institute of British Architects.

The first centre, designed by Judith Ledebcer, A.R.I.B.A., focused the attention of the Ministries of Health and Education, especially as the structure can be erected within one hundred man-hours, and is weather-proof and fire-proof. The model is being shown to 60 depots of the London Fire Brigade, many members of which are making toys and equipment for the centres in their spare time, and it will then travel to Glasgow, where it is to be staged in the Building Centre. An "Ascot" multipoint heater, a model of which was included, supplies all the necessary hot water for the school.

Portable Lighting for Gas-Works

Raids or no raids, there are few, if any, items of equipment more essential for gas-works than safe, reliable, portable lighting, capable of being stored and yet instantly available for any emergency. Normal practice calls for such lighting in connexion with repairs and maintenance in positions where ordinary illumination is absent, and in atmospheres that necessitate the strictest precautions; added to normal practice there is the prevailing necessity for being prepared to meet emergencies in which light must be used in the midst of darkness for the saving of life as well as for the maintenance of service. It is to meet all these circumstances that Messrs. Oldham & Son, Ltd., Denton, Manchester, have perfected their "Toucan" shielded and directional lamps—one of a series of several types of portable electric lamps they have been producing for many years. The "Toucan" is of one-piece design with a built-in accumulator. It is re-chargeable and differs from ordinary accumulator types in that it can be stored, fully charged, ready for use. When not in use it needs only a "refresher" charge twice a year, and it can be quickly re-charged from any lighting socket. Up to 25 hours' continuous light is available without re-charging, with little noticeable diminution in candle-power, and the double-filament gas-filled bulb has a life of 500 hours, compared with the 10 hours' life of the ordinary flash lamp type of bulb.

Gas Radiators

Among recent patents is one (No. 535,436; application date, Nov. 30, 1940) taken out by Cannon Iron Foundries, Ltd., R. T. Clayton, W. E. Benton, and A. F. Oatley. It relates to gas radiators.

The invention is concerned with apparatus of the kind comprising a radiating unit to which the flame and products of combustion from a gas burner or burners below the unit are fed, and in such apparatus provides an arrangement of the gas burner or burners within a combustion chamber which has an inclined wall or inclined walls adjacent the burner or burners and facing a reflector disposed below the chamber to reflect forwardly of the apparatus, heat radiation from the wall or walls of the chamber. The combustion chamber may taper upwardly towards the radiating unit and the burner or burners may be arranged within the lower part of the chamber, the front wall of which is inclined backwardly and upwardly to face the reflector. Furthermore, the lower part of this wall which is adjacent the hottest part of the burner flame or flames may be inclined at a more obtuse angle to the vertical than the upper part and the reflector be made at least in part parabolic with a focus lying approximately in this lower part.

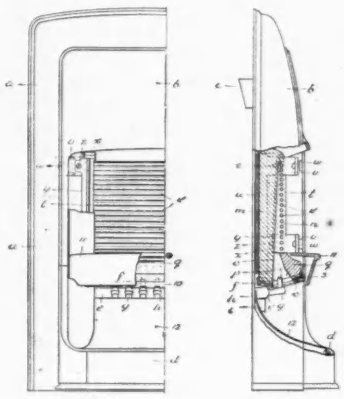

FIG. 1 FIG. 2

Fig. 1 is a front elevation of the fire and fig. 2 is a sectional view omitting the usual canopy and top of the casing.

In the illustrated fire, the frame *a*, the head or canopy *b*, the means for carrying away the products from the head or top of the casing, such as the flue *c*, and the arrangement of the fender or front *d* may follow on any approved lines found suitable for the particular circumstances.

The burner unit *e* admits of modification in design and arrangement but is shown as comprising simple gas burner nozzles *f*, which may be of steatite or other refractory material, carried by tubular brackets *g* projecting forwardly from a horizontal supply tube *h* to which a connecting tube *i*, arranged in the side framing or casing, is led from a suitable supply connexoin projecting outside the apparatus and provided with a control cock in the usual way. The burner is preferably not an aerated burner of the bunsen type, but supplies gas to ordinary fishtail or batswing burner nozzles.

The heat radiating unit will be found fully described in the Specification of copending application No. 532,518. It consists of a vertical or substantially vertical series of refractory members *k* arranged in front of a refractory backing piece *m* with a space or passage *n* between them.

The combustion chamber *o* has upwardly converging front and back walls of refractory material, its back wall *p* being that of the lower part of the backing piece *m*. The front brick *q* is supported before the wall *p* and has a rear surface which slopes upwardly towards the latter and forms the front wall of the combustion chamber which thus tapers towards the passage *n* of the radiating unit. This front wall further has an upper part rearwardly inclined at only a slight slope to the vertical and a lower part *s* at a much more obtuse angle to the vertical. This part *s* is opposite the hot parts of the flames arising from the burner nozzles *f*.

The backing *m* is secured by a troughed metal plate *u* having arms *v* screwed to the casting at *w*, and the side pieces *t* have lateral lugs *x* at the top and bottom which are overlain by a metal clamping piece *y* at each side of the fire screwed at *z* into the arms *v*.

The foot of the backing piece and the front brick *q* of the combustion chamber *o* are received in the cross support 10 and this support as well as the wall of the combustion chamber are concealed by a shaped balcony strip 11 extending across the front of the fire casing.

Below the cross support 10 a reflector 12 is secured in the casing so that heat radiation from the inclined walls of the combustion chamber *o*, or at least from the front wall, are reflected forwardly near the bottom of the apparatus.

A convenient reflector is a curved polished metal sheet which in part at least is a parabolic curve the focus of which lies approximately in the inclined lower surface *s* of the front wall of the combustion chamber. The lower and forward part of this reflector may be useful in reflecting radiations also from the back wall *p* of the combustion chamber.

The fender, of the usual type practically enclosing the lower part of the fire, would be made by us of a very openwork or skeleton character, but we prefer to omit a fender of this type and employ a small one below the front edge of the reflector 12 which is extended forwardly so that the object of utilizing the reflected radiation from the incandescent walls of the combustion chamber to supplement the radiant heat from the radiating unit proper is more effectively carried out.

The Central Executive Board of the National Gas Council is to meet at Gas Industry House at 12.30 p.m. on July 8. A meeting of the Central Committee of the Federation of Gas Employers will follow.

DISCUSSION ON THE INSTITUTION SYMPOSIUM—THE GAS INDUSTRY: 1941 AND AFTER

To-day we begin our report of the discussion on the nine short Papers submitted at the 78th Annual Meeting of The Institution of Gas Engineers held on June 11. The Papers were published in full in our issue of June 18, which contained an account of the proceedings at the Meeting. For the sake of clarity we have so arranged speakers' remarks that they fall into logical order of discussion on individual contributions. This, with one exception. Where the remarks of those who took part dealt collectively with two or more Papers in such a way as to make it undesirable to segregate their references to individual Papers we have included these under a "General" heading. We feel that this plan will appeal to readers as constituting a consecutive story at the present and a ready reference for the future.

General

Mr. **J. H. Richmond** (Runcorn): In the short space of time available it is impossible to make as full comment on any one of the short Papers as one would wish, so I have ventured to embrace several of these Papers in formulating my remarks. As one of the younger executives, and therefore one who has still to look forward with anticipation to the future of our Industry, it is stimulating and helpful to find that to-day the Authors of these Papers are almost of one accord, and that their thoughts and minds are attuned to the requirements of the Gas Industry if, in the future, it is to maintain its rightful place in post-war national economy. Colonel Carr in his Paper suggests that this problem of post-war reconstruction should be tackled forthwith by a Committee drawn from existing national bodies, and I would suggest that the titles of the Papers presented to-day would form the basis of terms of reference for such a Committee. The suggestions contained in each Paper seem to me to bear upon one another in such an intimate manner than no one set of conditions could come into practice unless the ideas underlying each one came into line simultaneously. Such a Committee as suggested by Colonel Carr would obviously be the first step to be taken, and the constitution of such a Committee would be of vital importance, as since the events of the past months and indeed the actual need prior to the outbreak of war has been noticeable, one is tempted to suggest that some new scheme of representation on National Bodies is necessary to ensure that the varying requirements of the provincial undertakings and districts are fully appreciated and met. Dr. Foxwell's contribution, I would suggest, forms the second step towards the common goal, and his final statement very briefly but very adequately sums up the position. He does not, however, put forward any concrete suggestions as to what is to be the method of approach to the complex problem of industrial and commercial agreement between the Gas Industry, which at the outset would require complete understanding between local authority, private, and holding company interests, and the by-product coking industry, the tar distilling and by-products industry, and the coal industry. Possibly this omission is due to a realization of the fact that before such an agreement could be reached, involving, as it would, a change of viewpoint in certain directions, it would need to be backed by some form of legislation. On the assumption that the co-ordination of the gas and associated industries is to develop on the lines suggested by Colonel Carr and Dr. Foxwell, the suggestions and requirements of the other Authors in such matters as standardization of calorific value and of appliances would doubtless in their turn demand attention, and follow as a natural outcome of rationalization. Finally, turning to Mr. Terrace's contribution, it is obvious that the opportunity for men coming into such an organized industry would be boundless, and it would be of paramount importance to ensure that adequate remuneration was available for those fitted to take their place in the Industry. I would like to draw attention to the last paragraph of the Paper. So many men, although fully qualified in a particular branch of technology, fail to attain their reward through a lack of knowledge or understanding of matters outside their own branch of science, and of their fellow men. Lastly, on the question of education, I am convinced that it is of vital importance that the executives and administrators of the future should have a complete understanding and appreciation of staff and personnel under their control. Such appreciation of staff and personnel can only be obtained by an apprenticeship served in close association with the type of labour which they will be expected to control in the years to come.

Mr. **J. R. W. Alexander** (General Manager, Associated Gas and Water Undertakings, Ltd.): The Institution of Gas Engineers owes its pre-eminence in the Gas Industry and its standing amongst the Scientific Societies to the high order of its work. It has certainly gathered together, under the heading of "The Future," a well-balanced series of short Papers dealing authoritatively with several topics of importance to the Gas Industry, and it is to be congratulated on having done so. There have often been suggestions, particularly in the Gas Press, that the specialized, necessarily lengthy, and mostly highly technical Papers normally presented at General Meetings of the Institution are of limited general interest, are not properly studied, do not lead to spontaneous discussion and, therefore, do not have the beneficial results which their undoubted merits deserve. The innovation of this Symposium certainly meets the needs of those who take this view and, assuming the success of the discussion, it may well be worth considering whether the customary Papers should not be published at intervals during the year, itself advantageous in many ways, and summaries of them and symposia on the subject presented, in the present easily digestible form, for discussion at the General Meetings.

Dr. **E. W. Smith**: The President is to be congratulated in the arrangements he has made for this discussion, including his selection of subjects of immediate importance to the Industry and of the Authors. From my many contacts in different parts of the country, I believe it is safe to assume that there is a substantial section of the Industry that believes:

1. That the wide variations—as between undertakings—in gas quality should be drastically reduced.
2. That the sulphur content of town gas should be reduced to the lowest practicable minimum.
3. That coke quality and sizing should be given much more attention with the ultimate aim of standardization from the point of view of the uses to which it is to be put.
4. That the national standardization of gas appliances is long overdue if cheaper and better equipment is to be available.
5. That time and money spent in developing the uses of gas for commercial and industrial uses is well spent.
6. That encouragement should be given to considered schemes for the improvement of the technical education of the rising generation.
7. That the Technical Press has served the industry well, and that it is expected to discuss "policy" and explore modern trends in administration and technique. There is no room for a "yes, yes" or bouquet Press.
8. That the Industry has an excellent future *only* if, as an Industry, it is rationalized.

So much for the subject-matter of the Papers.

I am not alone in believing that the Industry is at the parting of the ways. We can continue the old order, each undertaking being a law unto itself, happily collaborating, on occasions, with other undertakings, taking the advice of the national bodies, or not, as in their wisdom they may so decide, *or* we can become a thoroughly co-ordinated Industry. If we continue as now I see no satisfactory future for it. If we are prepared to accept radical changes, I am confident of the future.

But what will such changes entail? The answer to that question depends on the National Fuel Policy. We should insist by every means in our power as individuals that the Government should formulate its policy concerning fuel and power. It is conceivable that more is "in the wind" than we know. It is possible that at any time we may hear that there has been formed a Ministry of Fuel and Power. Such a Ministry would presumably take over the powers now vested in the Ministry of Mines, the Ministry of Transport, and the Board of Trade so far as they concern coal and electricity and gas. I believe that a Ministry of Fuel and Power, if formed, should be the most important Ministry of the Government so far as our natural resources are concerned. But how shall we stand under such a regime? Rightly or wrongly I have formed the impression that the standing of the Industry in Government quarters is not nearly as high as it should be. As an Industry I am afraid we count for too little. We are not held in sufficient respect, and I believe it is largely our own fault. We are still little more than a loose aggregation of individual independent entities. We are not, except as a courtesy, a truly National Industry. Colonel Carr and others have described from time to time the possibilities of "Regionalizing," "Gas Boards," &c., and I, among many others in the country, had hoped that our national organizations would, by this time, have formulated far-reaching proposals for the administration and financial control of the Industry. It would have been better to be ready with our own

scheme rather than to have one imposed upon us. This I am afraid will be the case. I believe that Gas Commissioners are inevitable. Cannot we steer them the way we should like them to go?

The Gas Industry is buying its raw material from a Government-backed coal industry, transporting its raw material on what is likely to be in the future a Government-controlled railway system. Our Industry is limited in its freedom by Government Departments, and selling against Government-backed products—electricity and oil. Can it be hoped that we can possibly evolve economically and hold our proper place as unco-ordinated undertakings?

That is the problem. What are we going to do about it?

Mr. J. E. Davis (South Metropolitan Gas Company): When I was preparing some notes for my remarks to-day I was impressed with the fact that although the Papers in this Symposium showed a very real desire to improve the position of the Gas Industry when the time comes for post-war reconstruction, it was disappointing to see that there did not appear to be any real theme around which the Papers were built. To some extent the Presidential Address has supplied that theme, but, even so, one does perhaps feel that when discussing such matters as standardization, calorific value, removal of sulphur, co-ordination of the Gas Industry and so forth, one wants to know with what object, with what main object, all these things are to be done. Is it to be a bigger Gas Industry doing a bigger public service than it has done hitherto? If so, possibly many of these detailed matters will need to be considered in a very different light. In one of the Papers there is a reference to the "all-gas house," a very brief reference which is rapidly turned aside in favour of the "all-gas products house." Well, which is it we want? That might have a very important bearing on the question of the standardization of calorific value. I think that until the objective is a little more clearly defined, co-ordination and the settlement of standardization and some of these other matters can hardly be achieved. Perhaps the reason for the apparently inconclusive nature of some of the Papers is the absence of sufficiently detailed and extensive data about the business of the Gas Industry. On the question of calorific value, for example, a summary is given of the declared values as they are, but it would seem necessary, before any standard for the country can be reached, that there should be some knowledge of the reasons which have led to the wide variety of values chosen. I do not mean just general knowledge, but particular knowledge. The same thing applies in the matter of sulphur removal. Some gas undertakings are very keen, others are not. Are there, perhaps, local circumstances either in methods of manufacture or in local matters of marketing or possibly in the local policy of the gas undertaking with regard to their appliance maintenance? The collection of detailed information of this nature would enable standardization and future policy to be framed with full cognizance of the problems to be faced, and of the possibilities that are open.

Dr. Foxwell has suggested the separation of the Gas Research Board into a section to deal with coke and another to deal with gas. I could more easily lend support to a suggestion for a section to deal with manufacture, and one to deal with utilization, than to separating one product so widely from another. Better still, why not propose the formation of a statistical section to obtain and sort out data of the type which must be known before far-reaching decisions are made?

Professor **D. T. A. Townend**: There seem to be two appeals brought out in most of the Papers, the one for collaboration and the other for co-ordination and standardization. No one will quarrel with either of these, for it is fitting that times like these should hasten sacrifice of individualism in the common interest—so that, pulling together, the best may be obtained by a pooling of knowledge and ideas; it is apparent also that certain standardization is long overdue.

There is much that could be said on the issues raised in the Papers; many of us, however, are particularly interested in those matters related to present and future research. Special importance attaches to Sir Frederick West's Paper on "The Standardization of Calorific Values." It seems obvious that something should be done to attain this end, yet one cannot overnight, so to speak, change the various gas manufacturing plant so that calorific values would become more uniform, although, as pointed out, in certain instances, such as supplies from the companies in London and the South-East, a standard of (say) 500 B.Th.U. might be adopted. Assuming benzole stripping, the main constituents of town gas are hydrogen, carbon-monoxide, and methane, and the thought arises how helpful it might be if ever the idea of adjusting calorific value by catalytic methods, promulgated some 30 odd years ago, could be put into practice. Any levelling of calorific values must also be accompanied by close similarity in chemical compositions of supplies; are we in a position to define the characteristics of the supply which would be most generally welcome? This seems an issue on which some measure of agreement should be sought. And here perhaps one may reflect on the advantages which the flexibility of high-pressure gasification may provide.

In many ways the present war occurred at a time when the researches of the Gas Industry were at a most interesting stage; and although progress along those lines in which our interest is keenest cannot now always be as rapid as in normal times, much is being learned. It is the more opportune that the Industry, as in this Symposium, should take stock and pool its present knowledge and ideas, so that from all sides its resources may be turned to best advantage immediately the moment for active reconstruction arrives.

An interesting issue receives mention in Dr. Foxwell's contribution in that it is now obvious that the proper utilization of raw coal must be regarded as a problem of major national interest, and in its future processing by new methods the Gas Industry must play a leading part. We should, for example, follow closely recent developments in the oil industry, which has taken a lead in the production of synthetic fuels and chemical products. It may be open to doubt whether raw coal should nowadays be so brutally roasted in order to get our gas supplies—with an apparent disregard of any search for possible chemical processes which might with advantage be operated at quite low temperatures. Indeed the work of Dr. Dent and his colleagues under the Joint Research Committee indicates a path whereby we may gasify only such carbonaceous material as that for which we have little other advantageous use. We must, therefore, among other things, see how full advantage can be taken of this knowledge to avoid the production of such comparatively useless highly condensed ring systems as pitch, and replace them by chemical products having wider demand.

On the side of industrial heating, Mr. Hems's Paper typifies the enthusiasm with which gas centres are now carrying out their work, and it is quite obvious that the war should lead to important developments in this field. There is scope for considerable advance, both in the scientific understanding and practical application of gas heating.

Mr. Terrace's Paper on "Education in the Post-war Gas Industry" is also opportune. It needs no emphasis that the Gas Industry should make a drive to recruit into its service its proper quota of the best young brains in the country. We know, on the scientific side, for instance, that it may be doubted whether the Industry is getting a proper share of men of right calibre. If the Gas Industry is to get the men it needs, it must make it more obvious that there are the right openings for careers in it; and another of the difficulties of the moment is to ensure that school masters, in advising their students on future careers, do not overlook the opportunities which applied science offers to capable men.

Sir Frederick West's Paper

Mr. K. C. Mead (Gas Light and Coke Company): Would Sir Frederick West be good enough to amplify his remark in which he says, "In districts where the selling value of coke is high in relation to the cost of coal, the tendency will be to produce a less volume of gas at a high value, with consequently more coke for sale, in order to produce gas at the lowest possible cost"? If he will amplify that remark it may make it a bit more straightforward.

Mr. R. L. Greaves (St. Helens): I should like to refer to Sir Frederick West's Paper, more from the point of view of observation and question. I think personally that his argument is overwhelming, and in view of that fact I endorse the last sentence of his Paper in which he puts forward the idea that The Institution and the National Gas Council should come to an authoritative decision or recommendation. One is rather hoping that that is going to be done, and that a definite lead will be given not only on this problem of extraction, but also on some of these other important matters.

Mr. G. H. Fuidge (South Metropolitan Gas Company): The standardization of calorific value at one of three or four values throughout the country as proposed by Sir Frederick West would do much to simplify the design and construction of gas appliances and, more important, to improve the service obtained from appliances by the consuming public. Gas appliances are unlikely consistently to give the best performance if they are encumbered with adjustable air and gas ports which require to be set by the fitter or by the consumer himself. It is almost certain, however, that adjustable parts could not be eliminated and the ideal of fixed air and gas ports achieved if the calorific value alone were standardized. Sir Frederick refers to the additional problem of the diversity of combustion characteristics, but if I read the paragraph aright he infers that the standardization of this property also is an ideal unlikely to be attained. I think it would be unfortunate if this were assumed to be the case. It would, of course, be more difficult to standardize both combustion characteristics and calorific value, but it is strongly urged that this course should be looked upon as the attainable ideal. As the 44th Report of the Combustion Characteristics Sub-Committee showed, the Aeration Test Burner provides a simple means of obtaining a fair measure of combustion characteristics, which is especially suited for works control. The work of the Gas Light and Coke Company (44th Report, Part IV) has indicated the permissible limits of variation of A.T.B. number which are within the tolerances of burners having fixed gas and air ports, and it is believed that in practice, once the factors giving rise to changes in A.T.B. number were understood, it would not be found difficult for gas-works to be so operated as to keep this property of the gas within such limits. It would probably mean, however, that water gas plants could only be used to a limited extent as stand-by plant to meet changes in demand, and that the proportion of water gas added to the coal gas would require to be fairly constant, although a method of obtaining a town gas of constant A.T.B. number with different proportions of water gas has been described by Thorne and Stredwick ("GAS JOURNAL," 1938, **222**, 368).

Dr. M. Barash: The question of calorific value has already been referred to, and we are all agreed on the desirability of the simplification of the twenty-six different calorific values from which we suffer in this country. I would like to suggest that the present time is very opportune if we are to make any move with regard to the simplification of these declarations of calorific values. The present time is particularly apposite for making any such alterations, because as a war measure the process of re-declaration of calorific value has been simplified. The usual delay that seemed to be essential before the war has been completely eliminated, and the cost of re-declaration of calorific value has been completely eliminated, so I would suggest that

if a sub-committee of the Institution were formed the thing could be done easily and readily during the war period. The whole thing could be arranged within a short time. I doubt whether in normal times it could be arranged anything like so easily as at present.

Coming to the penultimate paragraph of Sir Frederick West's Paper he refers to a topic particularly close to my heart and which I particularly want to talk about, and that is the question of benzole washing. As most of you will probably realize, I am very intimately connected with that matter at present. Sir Frederick envisages the prospect that benzole washing is to be a permanent feature of gas manufacture, particularly if carried out from the point of view of sulphur removal or considerable sulphur reduction. I have been for the last eight or nine months intimately connected with benzole recovery, not on one works but at many. I have also had to work out a financial balance sheet on the subject. We are still lagging behind the coke oven industry. For myself I do not know a single coke oven plant not extracting benzole, because it pays and it is technically attractive. I do not know why the Gas Industry is not so far advanced. There are difficulties as regards coal prices and distribution of gas and so on which may influence it to a great extent, but at present we have got to the stage where it is not so much a question of the financial aspect. As regards the technical aspects of benzole recovery I do not need to elaborate to an audience like this. The advantage of reduction in sulphur has been brought out by Dr. Hartley in the second Paper of the Symposium. The reduction or complete elimination of naphthalene does not interest many of us. The really important aspect is that the nation at present, for the prosecution of the war, requires every possible gallon of benzole that the country can produce. I realize and I know quite well, for it is being pushed on me hundreds of times, that the coal position is acute and critical at present, and benzole recovery depends entirely on the question of having the coal to put into the retorts. We Britishers have the reputation of going down with the flag flying. We are not going down; we are very far from that, but striking the flag now while you still have the coal for the retorts means that we are actually losing the benzole that is absolutely essential to prevent the ship going down.

Mr. W. L. Boon's Paper

Mr. **G. H. Fuidge** (South Metropolitan Gas Company): I would like to support the Author's plea, and to go further and suggest an even greater degree of standardization than that asked for in the Paper. It is correct to say that size is one of the most important factors influencing the successful use of coke, but it is by no means the only important factor, particularly for domestic appliances, and consistently good results will not be obtained from such appliances unless the quality of the coke substance is also controlled. While coke must be looked upon as a by-product of the Gas Industry, albeit an important one, and the quantity and quality of the gas yield must take precedence over the quality of the coke, there is still no reason why coke properties should not be standardized to a considerable extent. Ash content and volume are perhaps beyond the control of the Gas Industry during wartime, but moisture can easily be controlled and combustilbility is capable of a definite degree of control by making use of the C.A.B. or the volatile therm test. As a matter of fact, control of coke combustibility as measured by the volatile therm content can serve as a very useful means of controlling carbonizing conditions. Density also has an important bearing on the use of coke in domestic appliances, and this would have to be taken into account in any proposals for standardization of coke quality.

Mr. **Moreland Fox** (London Manager, W. J. Jenkins & Co., Ltd.): Mr. Boon's paper is of timely value as a call to prepare for post-war conditions, and particularly for those of the immediate post-war period relating to the problem of the disposal of coke. Coke will still have to be manufactured from unsuitable and poor quality coals for some time after the war and sold in a fuel market which is likely to be glutted with coal, oil, and coke oven coke. Differences in the nature of coke, such as moisture and ash content, size, combustibility, ignitability, and reactivity may not individually be evident, but the effect of a combination of two or more of these variables is soon noticed by consumers, particularly those who may elect or be forced to purchase in the open market. Differences in coke quality—in other words lack of co-ordination between producers—affect marketing and produce dissatisfaction more than may be realized. I would remind gas engineers that they frequently base their experience of the use of coke on optimum conditions in that they have an unvarying supply from their own works, whereas many consumers purchase from a merchant who, in turn, may take his supplies from varying sources. On this ground alone, standardization of sizing is vitally necessary, as there is no doubt that this factor has an important influence on the usability of coke. The preparation of coke has been a major interest of our Company for the past forty years, and I would offer for the consideration of the meeting what I would describe as three basic principles of coke grading.

1. Primary scalping is essential whenever possible. By that we mean the removal of small coke up to, say, 1 in. from the run of retort coke, as this portion contains the bulk of the high ash and moisture content and this portion should be utilized for works purposes. Thereby the quality of saleable coke would be materially improved and render the value of standardization of sizing much more effective. 2. Main grading must be standardized to sizes established and guaranteed as having sufficient tolerance to cover other variants, such as ash, moisture, reactivity, &c. In our experience as screen manufacturers we are called upon to supply to the Gas Industry almost as many sizes of screen meshes as are attributed by Mr. Boon to the coke oven industry. 3. Debreezing at loading points is essential. By debreezing we do not mean de-dusting, and recommend that the size of the coke passing over the screen, that is, large coke 1 and 1A, should pass over a mesh of at least $\frac{3}{4}$ in. if not 1 in. square. This ensures a final guarantee of correct sizing and is particularly necessary with friable cokes. We are convinced that the adoption of these three recommendations would materially improve the quality of coke, and assist in standardization of quality to the extent that many of the difficulties of disposal would be automatically removed. In this problem of coke disposal co-operation is necessary between producers, selling agencies, and manufacturers of coke-burning appliances. It is unfortunate that the excellent series of Papers which were presented to the Industry over ten years ago and which embodied all modern practice have not been used to the general extent which those Papers deserved.

Dr. **C. H. Noton:** I want to say a few words about Mr. Boon's Paper. What I have to say is about Germany, but I should not like you to think me unpatriotic. Even the most patriotic of us will admit that we can learn something from the enemy. They make about 50 million tons of coke a year in Germany—43 million tons of furnace coke and 6 million tons of gas coke. About half of that is consumed privately—*i.e.*, it does not appear on the public market. The other half is sold publicly for various uses, and it is sold in four sizes, which are roughly $4\frac{1}{2}$ to $2\frac{1}{2}$ in., $2\frac{3}{4}$ to $1\frac{1}{2}$ in., $1\frac{1}{2}$ to $\frac{5}{8}$ in., and $\frac{5}{8}$ to $\frac{3}{8}$ in. There is also a size of breeze from $\frac{3}{8}$ in. down to nothing, which you can buy if you want it. There are no other sizes and you cannot get any other sizes of coke in Germany. These sizes are sufficient for public sales amounting to some 25 million tons of coke, and that is about as much coke as we make altogether in this country. That is standardization for you!

Recovery of Ammonium Formate

Among recent patents is one (No. 536,185; application date, Nov. 4, 1939) taken out by the Gas Light and Coke Company, W. K. Hutchison, and I. G. C. Dryden. It relates to the treatment of gas-scrubbing liquids. The patentees point out that when a gas-scrubbing liquid containing ammonia and/or ammonium carbonate is used in a cyclic process for washing a gas containing hydrogen cyanide and when regeneration of the liquor involves the application of heat thereto, ammonium formate be produced in accordance with the reaction

$$HCN + 2H_2O = HCOONH_4.$$

The resulting accumulation of the ammonium formate in the circulating liquor is undesirable, and the salt is a valuable by-product.

One object of the invention is to provide practical and efficient means for recovering ammonium formate in such a case. A typical example of the production of ammonium formate in a scrubbing liquor used cyclically may occur when crude coal gas (containing hydrogen cyanide) is scrubbed for the removal of hydrogen sulphide by means of an aqueous solution containing ammonia, ammonium carbonate (and it may be some ammonium hydrosulphide). An example of such a process is disclosed in British patent No. 488,951. In such a process further objects of this invention are that interference with the working conditions of the cyclic scrubbing shall be avoided and that the ingredients of the scrubbing liquor (other than ammonium formate) may still be utilized in the cycle.

This invention includes a process for the recovery of ammonium formate from a scrubbing liquor used cyclically and containing other ammonium compounds (such as ammonium hydroxide, ammonium carbonate, and/or ammonium hydrosulphide) which consists in removing continuously a portion of the scrubbing liquor, subjecting the portion to steam distillation to remove distillable ammonium compounds for return to the circulating liquor and recovering the ammonium formate from the residual portion or effluent.

The recovery of the ammonium formate from the residual portion of effluent may be effected by evaporation (*e.g.*, in a multi-stage evaporator) in order to obtain the dry salt or its concentrated solution.

The steam distillation of the removed portion of liquor may be effected by passing the portion through a stripping vessel (*e.g.*, a bubble-cup column) in which said portion (preferably near its boiling point) is treated in countercurrent flow with steam. Following is an example of the application of this invention to the recovery of ammonium formate from gas-scrubbing liquor.

In the scrubbing of crude coal gas containing hydrogen cyanide by a liquor used cyclically and containing ammonia, ammonium carbonate (and it may be some ammonium hydrosulphide) for the main purpose of removing hydrogen sulphide from the gas, the subsequent treatment of the scrubbing liquor involves (as in Patent No. 488,951) a heating of the liquor which results in the formation in the liquor of ammonium formate.

About 6% of the circulating liquor near its boiling point is continuously withdrawn from the circuit and passed into a bubble-cap column in which it is treated in countercurrent with steam at the rate of 10 lb. per gallon of liquor withdrawn. The free ammonia, carbon dioxide, and hydrosulphide are thereby distilled from the liquor, and are returned to the washing system at the point from which the hot liquor was withdrawn. These vapours serve instead of pure steam to heat and regenerate the scrubbing liquid. No free ammonia, carbon dioxide, or hydrogen sulphide is lost from the system. The hot effluent contains ammonium formate and a trace of free ammonia. This is concentrated by evaporation by known methods, for example in a multi-stage evaporator, in order to obtain the concentrated solution.

MANUFACTURE OF PLASTICS

[Contributed]

WHEN Dr. Baekeland first put to commercial use the synthetic resin which he named Bakelite he could not have visualized the wide application which would follow his discovery. First applied to electrical, dental, and the gramophone industries, and to processes using natural resin and rubber products, the utilization of plastics is now so universal that one can scarcely think of an article that cannot be fabricated in one or other of the many materials available.

Everyone is familiar with some of the commoner forms of plastics such as ash trays, fountain pens, telephones, switch covers, and fancy goods, but all are not aware that optical lenses, machine parts, furniture, chemical plant, bolts and screws, girders and joists for constructional work, pipes for carrying liquids and gases, can all be obtained in non-corrosible plastic materials of a strength suited to any stress and wear to which they are likely to be subjected.

The automobile and chemical industries, particularly, are daily becoming more dependent on these materials. Mudguards and even complete motor car bodies have been produced in pressings. One-piece, acid-proof chemical tanks 10 ft. by 10 ft. are being produced in more than one works, as, too, are pressed fusilages for aircraft. Where, a few years ago, plastics were a novelty devoted to producing small articles by hand presses, we now find them occupying a prominent position in industry, produced on gigantic machines capable of exerting a pressure of more than a thousand tons and carrying moulds weighing 10 tons each.

Plastics are of interest to the Gas Industry for two reasons. Many of the raw materials such as formaldehyde, phenols, and cresols, are derivatives of the by-products of gas manufacture; all the plastics require heat at some stage of the manufacturing process, and most of them require heat for drying, seasoning, moulding, and curing, all of which heating processes can be carried out either directly or indirectly by town gas.

The various grades of materials can be divided into two classes: (*a*) thermo-plastics—*i.e.*, those which can be moulded with or without heat and can be re-softened by heat and re-moulded, (*b*) thermo-setting plastics which can be moulded by heat, but cannot be re-softened and re-moulded. The first class covers such materials as rubber, casein, cellulose, and similar derivatives of natural products, which, although they can be moulded, pressed, and extruded, do not enter into industrial applications to the extent of class (*b*) which includes most of the formaldehyde plastics and these can be moulded, pressed, cast, extruded, and machined in a manner akin to the many ferrous and non-ferrous metals which they are largely replacing.

Research into the properties of plastics has led to the development of specifications and codes of testing, whereby a grade may be chosen with definite knowledge as to its performance under working conditions.

PROPERTIES OF PLASTICS.

Tensile strength	From	1.4 tons to 6.2 tons sq. in.
Specific gravity	,,	1.05 to 1.7.
Compression strength ...	,,	1.5 tons to 18.0 tons sq. in.
Brinell hardness	,,	19 to 45.

A comparison of the essential properties of an aluminium alloy largely used in aircraft construction and similar properties of a plastic which has largely superseded the alloy gives the following interesting figures:

	Aluminium alloy.	Plastic.
Tensile strength	8 tons sq. in.	4.4 tons sq. in.
Compression strength	22 ,,	18.0 ,,
Brinell hardness	55	45
Specific gravity	1.81	1.70
Thermal conductivity	0.32	0.002
Shrinkage on moulding	1.04%	0.006%

As the thermo-setting plastics are those of most interest from the point of potential gas consumption, a brief description of the process of manufacture of a typical phenol-formaldehyde plastic will give an indication of the field for town gas.

The main section of the plant is the digestor in which the raw materials are mixed and heated, and wherein the chemical reactions take place. The digestor is really a steam-jacketed boiler of a capacity up to 400 gall. constructed in monel metal or similar material, or from a material free from iron and lined with a vitreous substance, Projecting into the interior of the digester is a stirrer driven from an electric motor mounted on the framework of the plant. A pipe is provided to carry away fumes and evaporated water. This pipe serves the double purpose of flue and condenser, being so constructed that condensate instead of being permitted to return to the digester is led to a waste recovery tank for subsequent treatment. An outlet for running-off the finished material is provided at the base.

The steam jacket of the plant follows standard practice for such apparatus, being sturdily constructed to withstand high pressures, and fitted with pressure gauges, thermometers, and cleaning holes.

The actual output in plastic is approximately 25% of the weight of raw material charged into the digester, two main methods of working—single stage and two stage—being employed. In single stage working a charge is placed in the cold digester in the proportions, by weight, 50.7% phenol, 48.2% formaldehyde, and 1% ammonia in the order named, and the lid closed and sealed. The stirrer is put into operation and steam admitted to the jacket with the valve regulated to permit a rise in temperature at the rate of 4°–5°F. per minute until a temperature of 160°F. is reached. The rate of heating is then reduced until 175°F., when the steam is shut off and the mass allowed to rise to 195°F. by its own reaction. The reaction may continue from 45 minutes to 2 hours or more, samples being taken during this period until no free formaldehyde is found, when the reaction is complete and the plastic formed as resin.

A further heating is necessary to remove the water originally forming part of the formeldahyde solution, and, as the plastic will harden if further heated to any appreciable degree vacuum distillation is employed at relatively low temperature, the vacuum being gradually increased until almost all the water evaporates. This can usually be accomplished without raising the temperature above 150°F. until the very last stages when a temperature of 180°–190°F. may be reached. The resinous mass is then run off from the base into trays and rapidly cooled by water circulation.

In the two-stage method of manufacture the same weight of phenol is used, but only half quantities—by weight—of formaldehyde and ammonia. Heating is carried out as in the single stage method until reaction is completed, following which the water is evaporated entirely by heating the mass to 230°F. After allowing to cool to 120°F. further quantities of formaldehyde and other materials are added and the whole heated slowly to 230°F., when the second reaction is completed and the plastic cooled and run off as in single stage practice.

From these details it will be clear that town gas boilers provide an ideal method of steam raising for the initial process of manufacture. Dust and dirt must be avoided at all costs, control of steam pressure must be simple, the heat available at any moment since the demand frequently fluctuates in accordance with the progress of the reaction in the digester. Temperatures, as such go, are relatively low and do not call for a high pressure of steam, nor is the demand for steam heavy except at the dehydration period.

The most general method of using thermo-setting plastics is moulding, for which purpose the material must first be thoroughly mixed with the filler, usually wood dust, slate dust, asbestos fibre, cotton, or some similar material added to give strength and tenacity. The raw plastic is passed between rollers heated, by steam, to a temperature of 120°F., and as they revolve they pick up the plastic which forms a soft sticky coating. The filler and colouring matter is then charged on to the rollers and gradually worked into the soft plastic. When all the filler is thoroughly intermixed the mass is scraped from the rollers and allowed to cool before being passed to the grinding machine, which breaks up the material into an extremely fine dust, which is usually 40–50% plastic and the balance filler in the form of a homogeneous, uniform, easy-flowing powder.

For some of the highest quality work the powder is dried for a period at a temperature of 150°F. to remove any trace of dampness. In both rolling and drying processes a gas-fired boiler is easily the most adaptable means of supplying the required heat.

Plastic moulding machines follow the general construction of metal presses, with a heavy framework, the lower half of the mould being carried on a platform and the upper half held in the moveable part of the press. Both halves are heated by steam, gas, or other means. Although steam can be successfully applied, it has certain inherent disadvantages. In the first place the atmosphere in the shop tends to become damp, thereby affecting the moulding powder and also causing inconvenience to the workers. Secondly, the steam must be conveyed through flexible pipes or pipes with flexible joints, thereby causing heavy maintenance charges in efforts to keep them steam tight. A third disadvantage lies in the fact that should a mishap occur in

(*Continued on p. 559.*)

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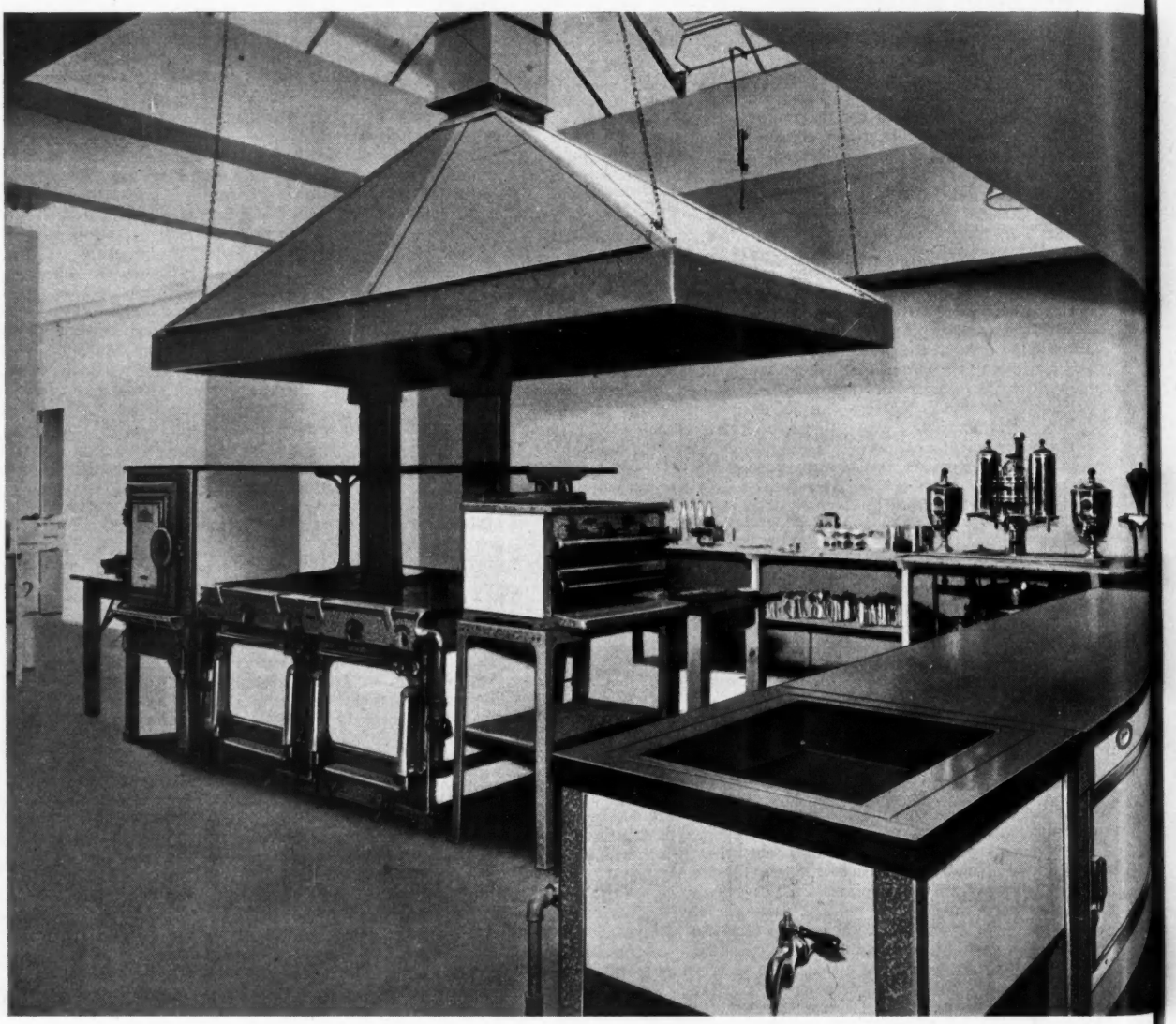

the steam raising plant the whole of the machines are out of commission until repairs are carried out. Lastly the flexible pipes are a source of danger to the workers from escaping steam and hot pipes.

Two methods of gas heating have been successfully applied: (*a*) pressure gas burning from special burners fitted around the upper and lower halves of the mould, (*b*) pressure gas burnt on the surface of a refractory material mounted below the lower half and above the upper half of the mould. In either case it is essential to carry the gas through flexible pipes in order to mitigate the shock to the pipe which occurs each time the press is closed.

With burners fitted around the moulds it is necessary to ensure perfect combustion at the burner head; to keep the flames as short and sharp as possible; and to prevent any unburnt gas circulating around and igniting away from the mould. It must be kept in mind, particularly as regards the moving burner, that this will be continually rising and falling, often through a distance of 12 in. or more, in a position where air for combustion cannot readily be picked up. Failure to recognize the importance of adequate pressure of gas and correct regulation of flame length have been the chief causes of complaint from users of this type of burner.

With surface combustion burners there is not the same need for care once satisfactory regulation has been established, but attention must be given to the refractory material—which should be as thick in section as can be conveniently used—and damaged surfaces replaced immediately.

The success or otherwise of plastic moulding depends even more upon the design of the mould than upon the heating. Some designs are extremely intricate and burners must be adaptable to their peculiarities in order to ensure that every portion of the mould is heated to the exact degree. Frequent manipulation of the gas control is not necessary if a correct type of burner is fitted, but in every case the control should be a small wheel valve, capable of adjustment within the finest limits, rather than the ordinary gas cock with thumb piece, although one of the latter may be used as a stop cock on each machine and kept fully open when the machine is in operation.

The heat output of the burners must be varied with every alteration in mould size, although manufacturers endeavour—as far as possible—to keep similar size moulds in use on individual machines, and the burner should be capable of an output of from 60 to 90 B.Th.U. per hour per square inch of mould surface without any depreciation in the efficiency of combustion.

In an industry expanding at the speed of the plastic industry new heating problems are continually arising and affording wider scope for the application of town gas.

COMPANY MEETING.

South-Eastern Gas Corporation

Dividend of 4%

The Ninth Ordinary General Meeting of South-Eastern Gas Corporation, Ltd., was held on Wednesday, June 18, at Gas Industry House, 1, Grosvenor Place, S.W.

Sir DAVID MILNE-WATSON, Bt., LL.D., D.L. (Chairman of the Company), presided.

A statement by the CHAIRMAN on the results for the year ended March 31, 1941, was circulated with the accounts. As an Order issued by the Board of Trade prohibited any publication of the accounts or working results of gas undertakings the statement dealt only with the accounts of the Corporation.

The Directors recommended the payment of a final dividend of 2½%, less tax, on the Ordinary shares, making 4%, less tax, for the year. This compared with a dividend of 5½% for the previous year, but was not unsatisfactory at a time when many gas undertakings were able to pay no dividends at all.

A Bill promoted by the Corporation to confer further powers on subsidiary companies received the Royal Assent in July, 1940. The main purpose of this was to give 10 companies additional capital powers, but certain administrative clauses were included so that a modern and uniform code of procedure was brought into force for the whole group.

The Chairman paid a tribute to the loyal service of the staff and employees of all companies under the most difficult conditions, and expressed the great appreciation of the directors for the courage and devotion to duty shown by all ranks.

The report and accounts were unanimously adopted and the dividend approved; the retiring Directors (Mr. R. W. Foot and Mr. T. Hardie) were re-elected; Messrs. Cash, Stone & Co. were reappointed as auditors.

The proceedings closed with a vote of thanks to the Chairman, Directors, and Staff, proposed by Captain W. J. LIBERTY.

Hot Water Supply and Central Heating Plant

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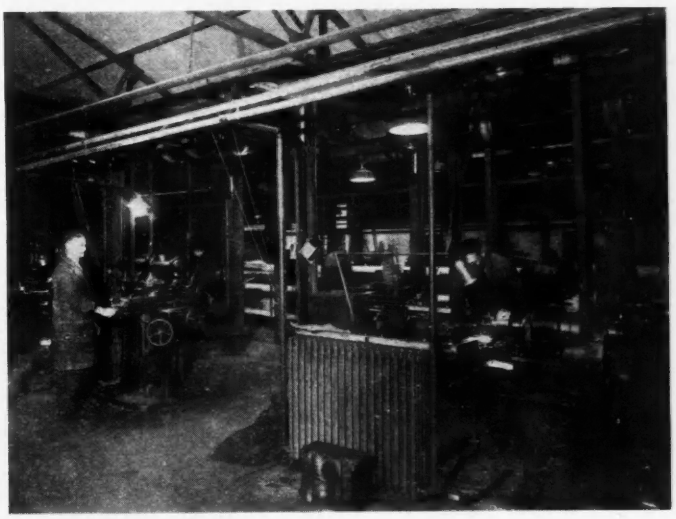

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Gas Products Prices

The London Market

June 23.

There are no changes to record in the values of Tar Products in the London Market, present prices being approximately as follows:

Pitch is nominal; creosote 4¾d. to 5d.; refined tar 3¾d. to 4d.; pure toluene under the Ministry of Supply Toluene No. 2 Order is 2s. 5d.; pure benzole is 1s. 10d.; 95/160 solvent naphtha 2s. 5d. to 2s. 8d.; and 90/160 pyridine 13s. 6d.; all per gallon naked; refined crystal naphthalene £23 per ton in bags; all prices are *ex* Makers' works.

The Provinces

June 23.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 1s. 10d. (controlled by the Control of Toluene No. 2 Order, July 5, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 10d. to 11d. Solvent naphtha, naked, North, 1s. 9d. to 1s. 10d. Heavy naphtha North, 1s. 6d. to 1s. 7½d. Creosote, *ex* works, in bulk, North, liquid and salty, 4½d. to 4¾d.; Scotland, 4¼d. to 4¾d.; low gravity, 4½d. to 4¾d. Fuel Grade, 4d. to 4¼d. Carbolic acid, 60's, 3s. 7½d. to 3s. 9d. Naphthalene, £12 to £15. Salts, 70s. to 80s., bags included. Anthracene, "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal. Heavy oil: Unfiltered anthracene oil (min. gr. 1,080), 5¼d. to 5½d.; filtered heavy oil (min. gr. 1,080), 5¾d. to 6d.; heavy anthracene oil gr. less than 1,080, 6d. to 6¼d.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note in our issue of Sept. 4, 1940, p. 404.

Tar Products in Scotland

GLASGOW, June 21.

Considerable activity continues in almost all departments with prices firm.

Refined tar: Considerable quantities are now leaving the Works for normal purposes and prices are steady at 4¾d. to 5d. per gallon in the home market. Export demand is on a good scale with quotations at round 3¼d. per gallon, both f.o.r. naked.

Creosote oil continues in good call at the following prices: Specification oil, 5d. to 5¼d. per gallon; low gravity, 6d. to 6¼d. per gallon; neutral oil, 5¾d. to 6d. per gallon; all *ex* Works in bulk.

Cresylic acid cannot readily be secured for prompt delivery and, with demand continuing active, values are strong as under: Pale, 99/100%, 3s. to 3s. 2d. per gallon; Pale, 97/99%, 2s. 9d. to 2s. 11d. per gallon; Dark, 97/99%, 2s. 5d. to 2s. 7d. per gallon; all *ex* Works in buyers' packages.

Crude naphtha is maintained at round 6¼d. to 7¼d. per gallon *ex* Works in bulk, according to quality.

Solvent naphtha: 90/160 grade is 1s. 8¼d. to 1s. 9d. per gallon and 90/190 Heavy Naphtha is 1s. 4¼d. to 1s. 5¼d. per gallon.

Pyridines are purely nominal at about 14s. per gallon for 90/160 grade and 16s. per gallon for 90/140 grade.

At a Meeting of the Board on June 9 the Directors of Cannon Iron Foundries, Ltd., decided to postpone consideration of the payment of dividend on the 5½% Redeemable Cumulative Preference Shares until a later date. It was reported that the turnover for the eight months to May 31 exceeded that of the corresponding period of the previous year, and the volume of orders on hand was satisfactory.

Gas Stocks and Shares

Sentiment on the Stock Exchange throughout the best part of last week was generally cheerful. A feature was the renewal of a heavy demand for gilt-edged securities, most of which closed higher on the week—2½% Consols were ¾ stronger at 80¼. Home rail junior stocks came in for support and the tone of the market continued firm. The industrial market, however, was not so active as some others and suffered somewhat from a paucity of business, although a few leaders made small advances. The oil market, too, was quiet, but here again some of the favourites showed slight gains. Recent good rubber dividends led to more inquiries and the market was firm, while a speculative demand made the Kaffir market busier than of late.

There was a distinctly heavier volume of business in the Gas Market, especially among the fixed-interest stocks, a number of which were marked *ex div.* at the commencement of the week. A few of these hardened a point or two, otherwise, with one exception, there were no marked changes in the quotations compared with a week ago. The exception was Plymouth ordinary which recorded a heavy fall of 20 points to 73, although only in April the stock changed hands at 99.

The Directors of the United Kingdom Gas Corporation have declared a dividend for the year to Dec. 31 last of 4%, against an interim of 2% and a final of 3% for 1939.

The following price changes took place during the week:—

OFFICIAL LIST		
Bournemouth 4 p.c. Deb. (*x.d.*) ...	87—92	June 16
Bristol 4 p.c. Red. Deb. (*x.d.*) ..	75—80	,,
Commercial Ord.	24—29	−1
Gas Light 4 p.c. Pref.	50—55	+2
,, 3¾ Red. Pref.	62—67	−¾
Plymouth Ord.	68—78	−20
South-Eastern Gas Corporation Ord.	8/6—10/6	+-/6d.
South Metropolitan 3 p.c. Deb. ..	65—70	+2
South Suburban 5 p.c. Deb. (*x.d.*) ...	94—99	June 16
United Kingdom Gas Corporation 4½ p.c. 2nd non-cum. Pref. (*x.d.*)	10/—12/-	,,
Wandsworth 5 p.c. Deb (*x.d.*) ...	94—99	,,
,, 4½ p.c. Deb. (*x.d.*) ...	75—80	,,
SUPPLEMENTARY LIST		
Brighton 5 p.c. Deb. (*x.d.*)	88—93	June 16
,, 5½ p.c. Red. Deb (*x.d.*) ..	95—100	,,
Bristol 4 p.c. New Deb. (*x.d.*) ..	87—92	,,
Cheltenham 4 p.c. Deb. (*x.d.*) ...	75—80	,,
Derby 4 p.c. Red. Deb, (*x.d.*) ..	85—90	,,
Liverpool 3½ p.c. Red. Deb. (*x.d.*) ...	75—80	,,
Southampton 5 p.c. Red. Deb. (*x.d.*)	95—100	,,
York 5 p.c. Red. Deb. (*x.d.*)... ...	93—98	,,
PROVINCIAL EXCHANGES		
Bristol 5 p.c. Max.	84—86	−1
,, 1st 4 p.c. Deb....	94—96	+1½
,, 5 p.c. Deb.	110½—113½	+1½

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THE BOMBAY GAS COMPANY, LTD.

Annual Ordinary General Meeting

THE Annual Ordinary General Meeting of the Bombay Gas Company, Ltd., was held at the London Offices of the Company, Gresham House, Old Broad Street, London, E.C. 2, on Wednesday, June 18, Mr. HUGH H. MCLEOD (Chairman of the Directors) presiding.

The SECRETARY (Mr. E. Comber) read the notice convening the meeting, together with the Auditors' Reports. The Directors' Report and the Accounts of the Company for the year ended December 31, 1940, were taken as read.

Chairman's Address

The CHAIRMAN, in moving the adoption of the Report and Accounts, said: Since we last met the Company has sustained a grievous loss in the death of its esteemed Chairman, Mr. W. G. Bradshaw, C.B.E. He was a member of the Board for thirty-five years, during the last sixteen of which he acted as Chairman. His loss cannot be measured in words. The valuable services he rendered to the Company and his wise counsel in all our affairs are his real monument, for they are reflected in the position of the Company to-day. May I ask you to rise and pause for one minute in grateful recognition and as a token of respect for our late Chairman.

The meeting rose and stood in silence for one minute.

Continuing, the Chairman said: Another calamity which has befallen the Company is the loss of the London offices by enemy action, together with a considerable quantity of records. However, you see we have re-established ourselves in these offices and I think you will agree they are an improvement on the old accommodation. Mr. Comber, our Secretary, informs us that every one has been most helpful, and I and my colleagues would like now to express our appreciation to those persons for their kind assistance.

Continued Expansion of Sales

As to the accounts I need hardly explain that it will be wise in the present state of international affairs to curtail somewhat a review of the Company's activities. I can, however, assure you that everything possible has been done and is being done to further the interests of the Company in Bombay. The sale of gas continues to expand, and for the year under review it shows an increase of 7.1%. The issue of domestic appliances of all kinds, such as Cookers, Geysers, Gas Rings, Refrigerators, and so on keeps our Fittings Department extremely busy. You will be interested to learn that for the first quarter of the current year the progress of the Company is extremely promising. The Company's Works and Plant have been kept in a thorough state of repair, while the new Governor House and Boosting Plant are proving a great help to the distribution system.

There is little of special interest in the Accounts, but I will just refer to a few salient points. In the Capital Account you will notice that the expenditure for the year amounts to some £4,916, and in the past we have been in the habit of transferring to Revenue if possible such annual expenditure. This year, however, the Board have decided to show the annual capital expenditure and reduce it by yearly depreciation. The capital employed per million cu.ft. of gas sold works out to £610, which my technical colleagues advise me is an extremely satisfactory figure.

Increased Cost of Coal

In the Revenue Account it will be seen that Income Tax has been excluded therefrom and has been charged in the Net Revenue Account. The balance of the Revenue Account shows £11,581 in excess of the figure for the previous year. This is due mainly to increases in almost all departments of Revenue. Gas sales have increased by £9,906, Rentals by £1,392, and Residuals by £5,147. Expenditure, however, has also increased, but I need only refer to the cost of Coal, which shows an increase of £8,655. Apart from the increased quantity of coal carbonized the main reason for such a large increase in cost is the greatly increased Railway freight charges. In a full year the cost to the Company for freight on Coal will amount to Rs. 14/15/8½, or 22s. 6d. per ton, against Rs. 12/6/- or 18s. 6d. per ton for the year 1939, an increase of roughly 4s. per ton. Costs everywhere are on the upgrade nowadays, but as long as the expansion of the Company continues it is hoped to cope with any increased expenditure and to avoid having to increase the price of gas. An allocation of £7,000 to the Renewal and Contingency Fund has been considered necessary in view of the fact that two of the three gasholders will require to be re-sheeted in the near future.

The balance available for dividend, viz., £63,444 10s. 6d., shows an increase of £1,164 over that for the year 1939.

The Balance Sheet

As to the Balance Sheet, there seem to be few items requiring comment. Investments have been realized and are at present included in the Cash in Hand. The sale shows a profit on the book value of £1,455, as shown in the Net Revenue Account. In pursuance of Indian legislation the Company is required to create a Trust in connexion with the Provident Fund and employees' contributions must be invested in Indian Rupee Securities. We therefore took the opportunity of selling our securities at satisfactory prices for re-investment later in India. Stocks are higher, but that is due mainly to an increase in the valuation of the Coal Stock.

On the Assets side of the Balance Sheet the Suspense Account for Income Tax shows an increase of £2,599—a wise precaution in these times of higher taxation.

That concludes my brief survey of the Company's affairs, and you will agree that in spite of difficulties and anxieties the General Manager in Bombay and his staffs have obviously spared no effort further to improve the Company's position. I now move:

> "That the Report of the Directors and the audited Statement of Accounts for the year ended December 31, 1940, presented to the Meeting, be, and the same are hereby received, approved and adopted."

Mr. STANLEY H. JONES (Deputy Chairman) seconded the Resolution, and there being no questions or comments from Shareholders present it was put to the Meeting and carried unanimously.

The CHAIRMAN thereafter moved:

> "That a final dividend for the year ended 1940 of 4½% (less Income Tax at the rate of 5s. 8.72d. in the £) be now declared payable on and after June 30, 1941, making with the Interim Dividend of 3½% (less Income Tax) a dividend of 8% (less Income Tax) for the year."

Mr. BERTRAM W. ELLIS seconded the Resolution and it was put to the Meeting and carried unanimously.

Re-Election of Directors

The CHAIRMAN: The re-election of the retiring Directors is the next business of the Meeting, and I would like to propose their re-election. In Mr. Stanley Jones we have one whose experience in the Gas Industry is of immense assistance to the Board. In Mr. Bertram Ellis, whom we invited to join the Board, we have a desirable acquisition. He is Chairman of the Oriental Gas Company, our sister Company, and as no doubt most of you are aware the relations between the two Companies are not only cordial, but are closely intertwined. I now move:

> "That the retiring Directors, Mr. Stanley H. Jones and Mr. Bertram Ellis, being eligible and offering themselves for re-election be hereby re-elected accordingly."

Mr. GEORGE EVETTS seconded and the Resolution was carried unanimously.

Mr. STANLEY JONES briefly replied.

Mr. BERTRAM ELLIS: I thank you for my re-election. As a matter of interest, besides my long association with the Oriental Gas Company, your sister Company, I am a very old shareholder of the Bombay Gas Company, and many years ago was instrumental, with the aid of your Chairman, in introducing the use of Indian coal in your works. At that time the Company was using entirely English and Australian coals. It is a matter of interest to all of us, as we now use entirely Indian coal. May I conclude by saying I shall endeavour to deserve your confidence.

Mr. A. R. BURCH proposed the re-appointment of Mr. Alfred Morland, F.C.A., and Mr. F. J. Bradfield, F.C.I.S., as Auditors for the ensuing year at the same remuneration as hitherto.

Mr. H. F. HILLS seconded and the Resolution was carried unanimously. Mr. Bradfield returned thanks for his re-appointment.

Votes of Thanks

The CHAIRMAN: Before we part I would like to propose a vote of thanks to the General Manager and his European and Indian staffs in Bombay, and to the Secretary and his staff in London. I fancy you are all aware of the debt we owe to our staffs, both in Bombay and in London. Mr. Lane is a tower of strength to the Company in Bombay, and I hope we shall have him with us during the difficult years that lie ahead. Similarly I would like to emphasize our gratitude to the London staff. They have been through a gruelling time and have kept the flag flying under difficult conditions.

Mr. A. M. PADDON seconded and endorsed all that the Chairman had said. The Resolution was carried unanimously.

Commander ROBERT H. GLEN: There is one other resolution that should be proposed, and that is a Vote of Thanks to the Chairman and Directors for the work they have done for us. Like Mr. Comber and the London staff the Directors have also been going through a gruelling time, and the Balance Sheet which they have presented to us this afternoon shows a very excellent state of affairs. Therefore, I think we certainly cannot exclude the Directors from having some share in the good results we have had. On behalf of myself and the other Shareholders present and those who are eloquent by their absence, I have pleasure in proposing a Vote of Thanks to the Chairman and Directors for the excellent work they have done for us in the past year.

Mr. H. KING HILLER seconded and the Resolution was carried unanimously.

The CHAIRMAN assured the Meeting that the Board greatly appreciated the Vote of Thanks.

JUL 22 1941

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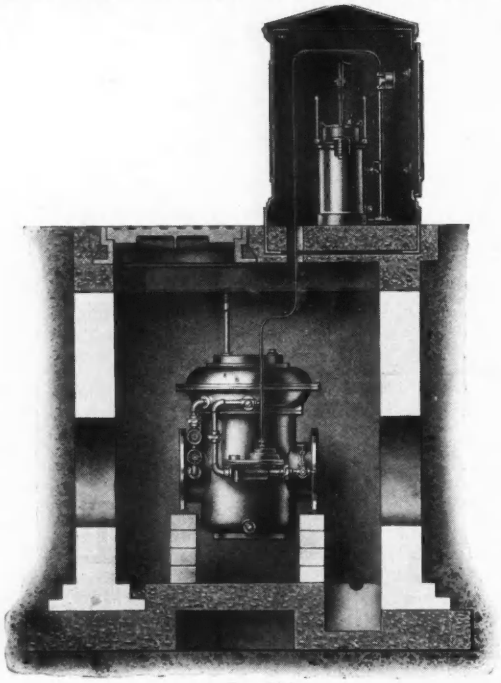

Fig. 824

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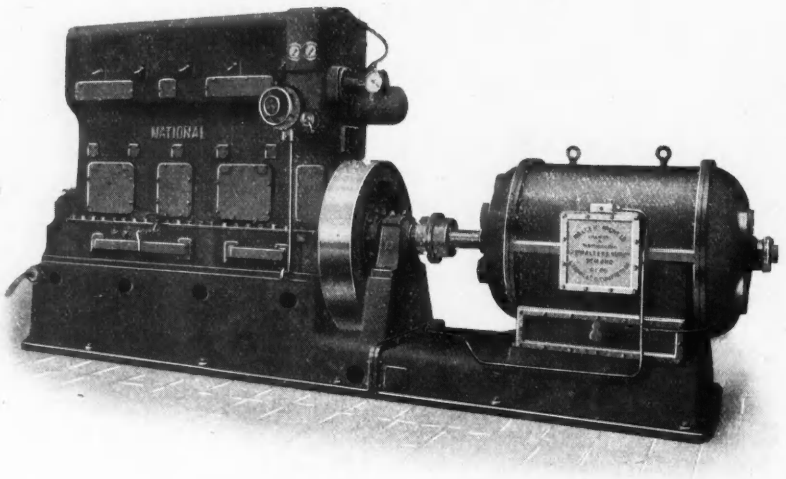

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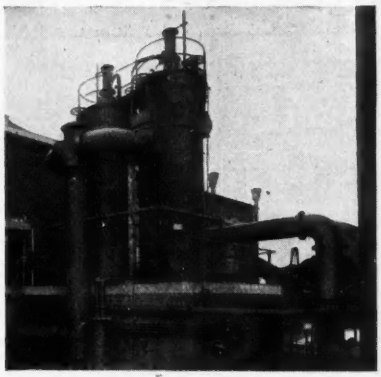

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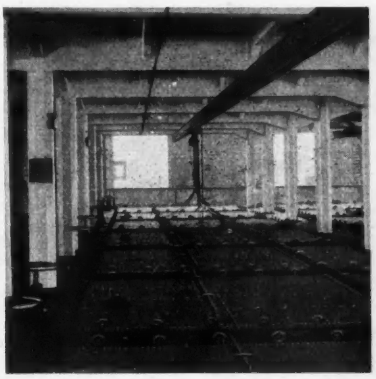

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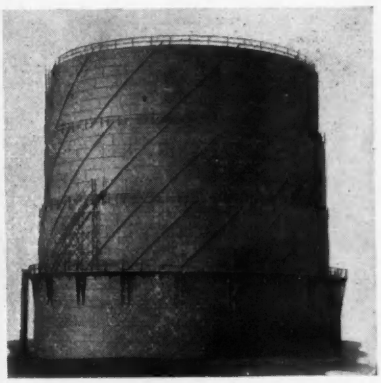

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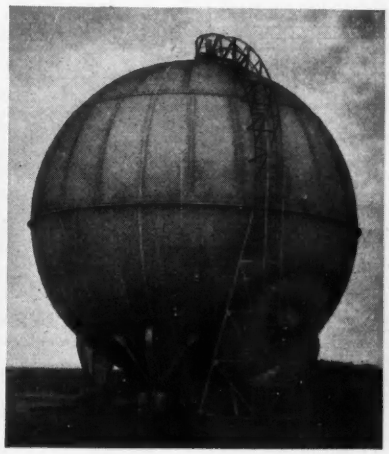

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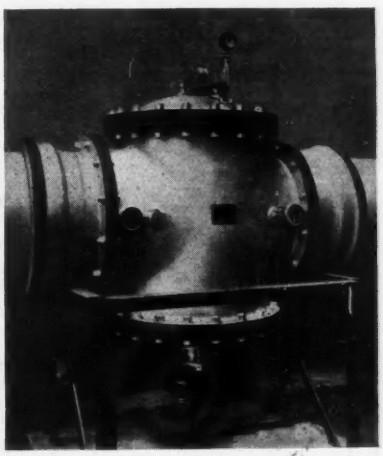

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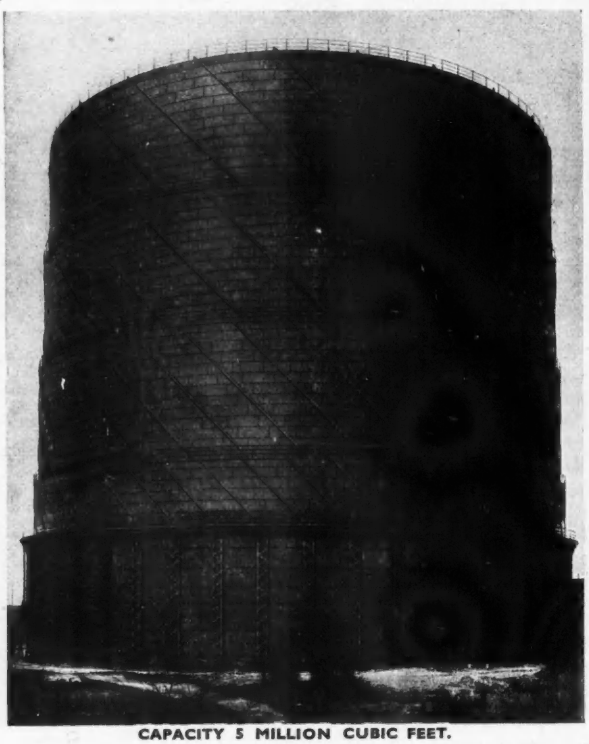

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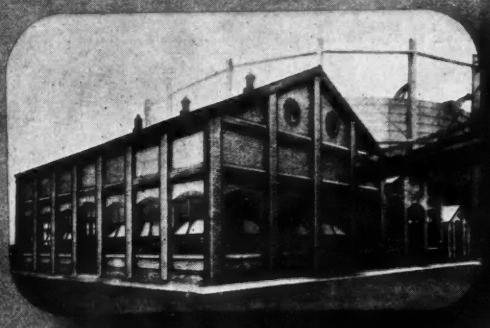

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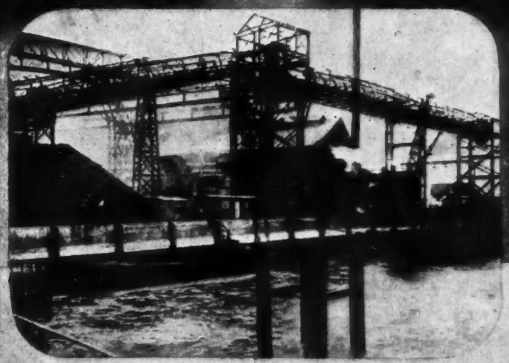

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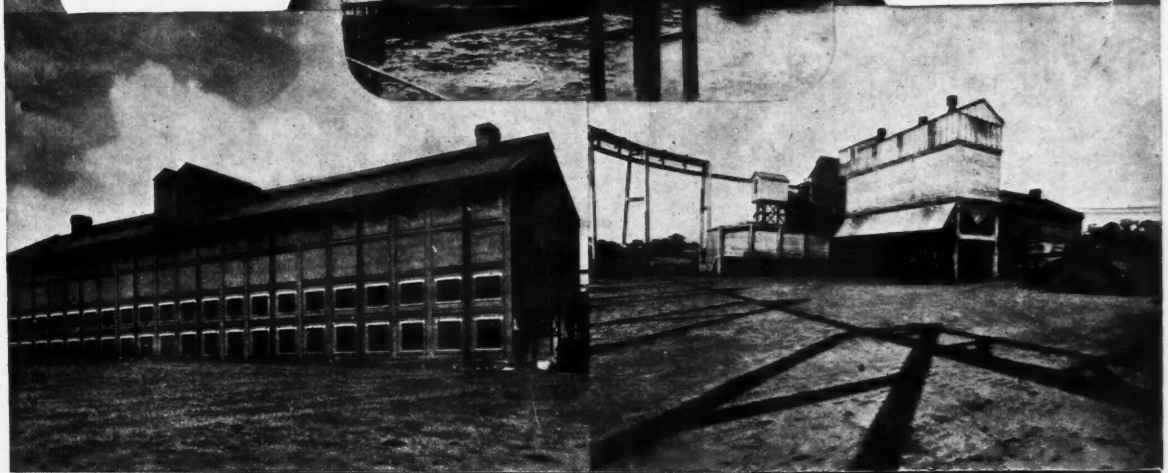

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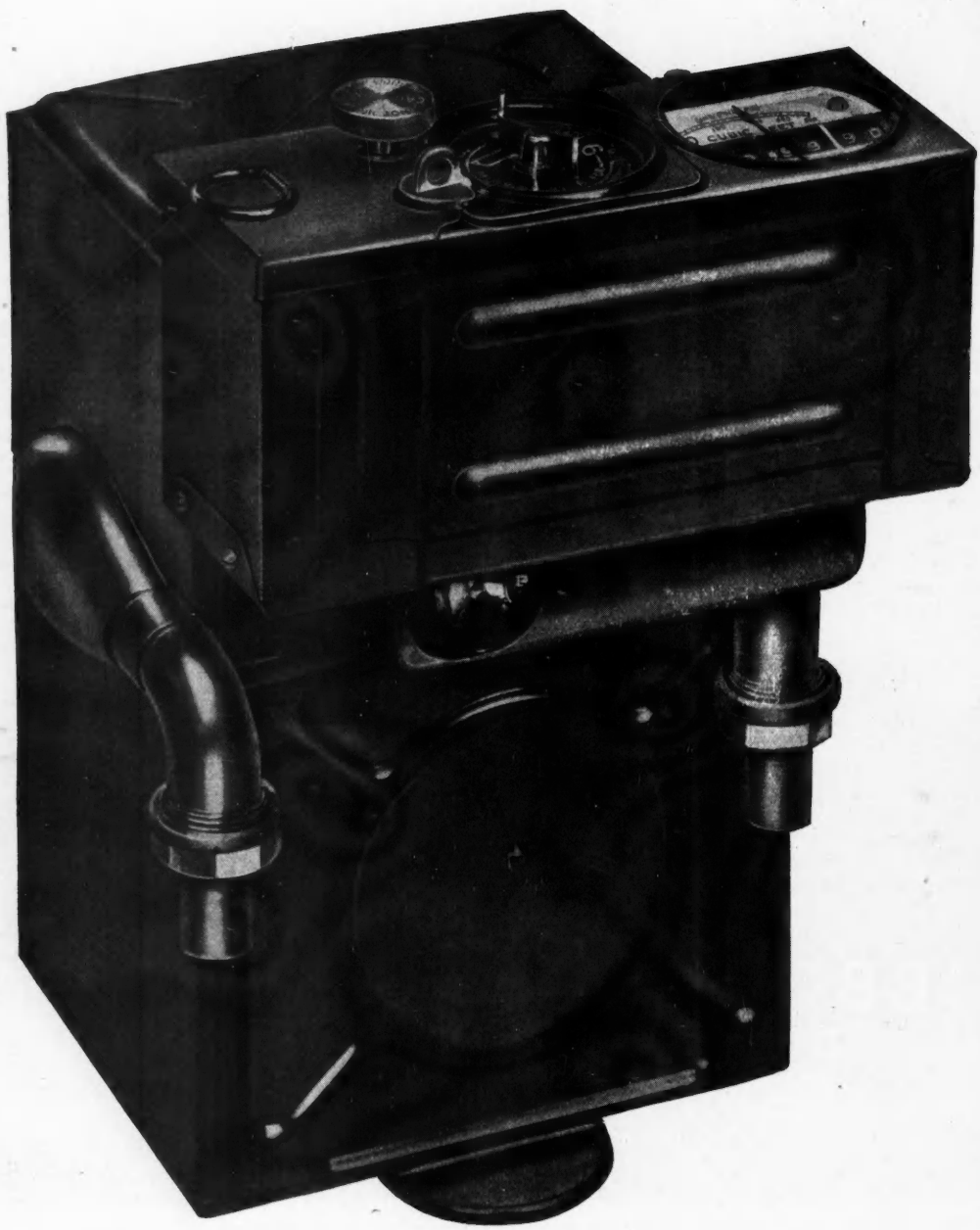

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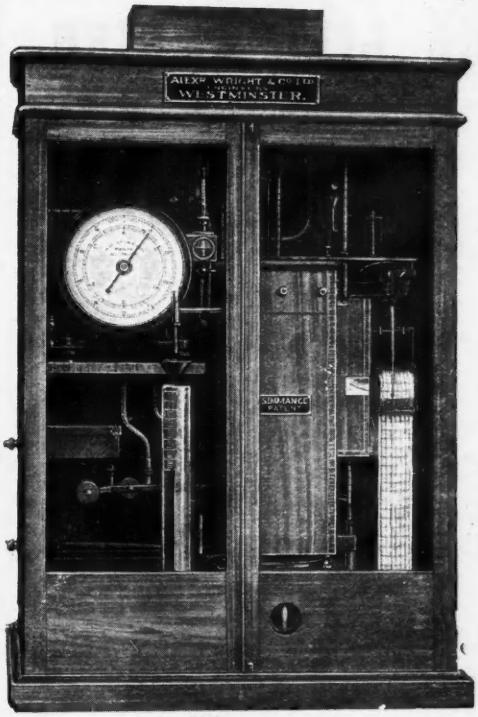

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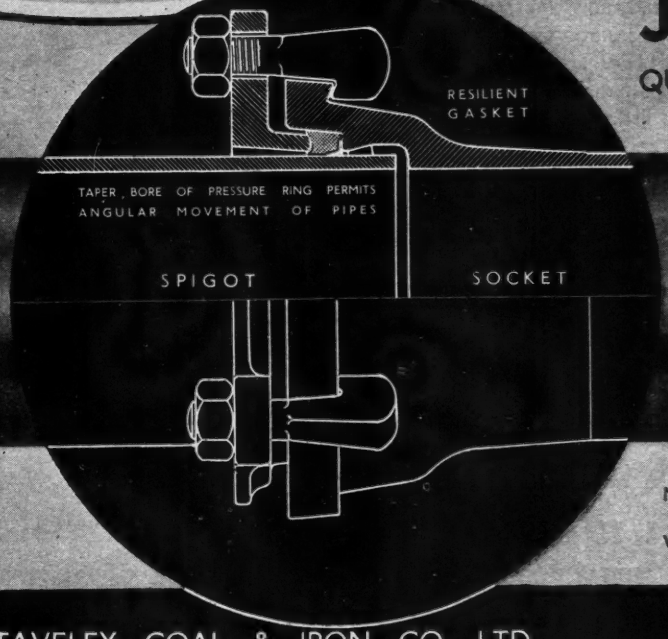

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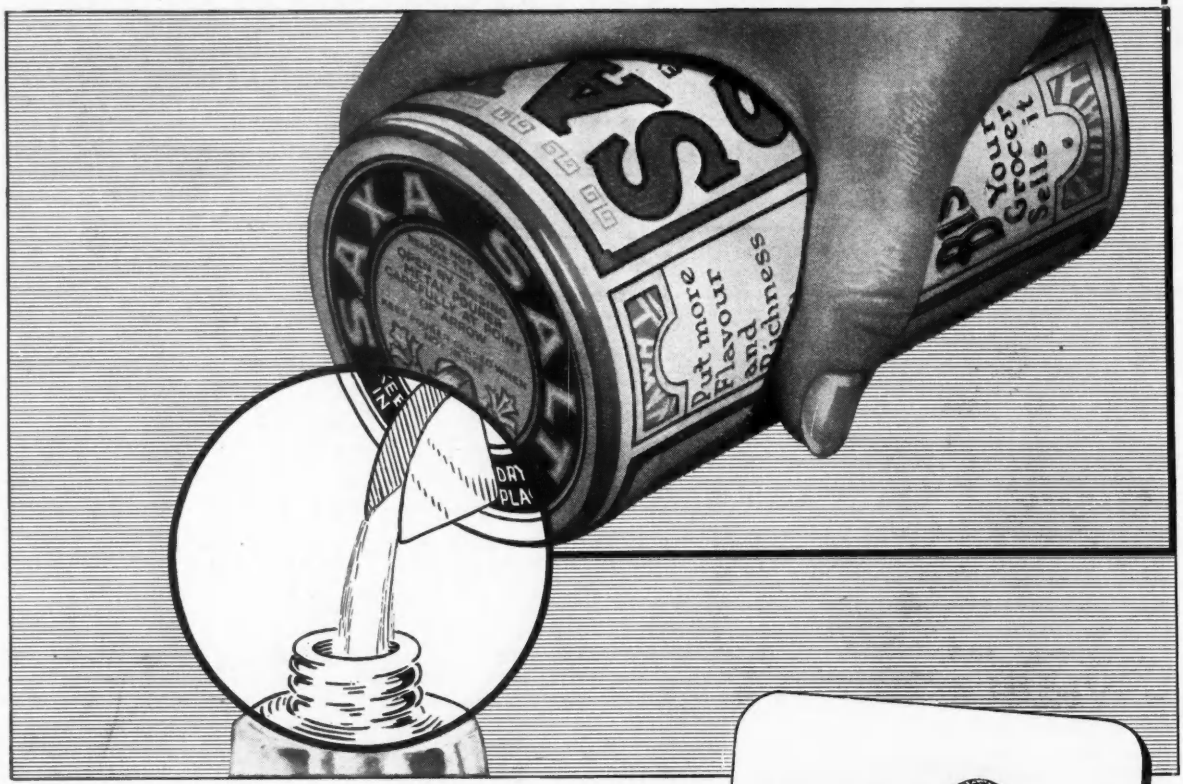
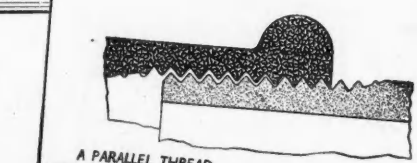
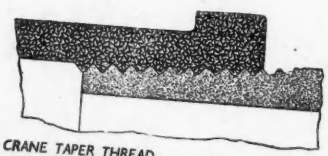


Until someone fell upon the idea of fitting the carton with a spout or funnel, how needlessly inconvenient was the handling of household salt; and how inconvenient, too, was the handling of pipe fittings until Crane came along with the TAPER-TO-TAPER THREAD, which has made life easier for engineers by ensuring for them strong, non-corrosive, trouble-free joints. Crane fittings are British Standard.



A PARALLEL THREAD.
Many threads doing no work, although wrench tight. That's where corrosion starts. Note also that the thread is cut into the thickness of the actual fittings.



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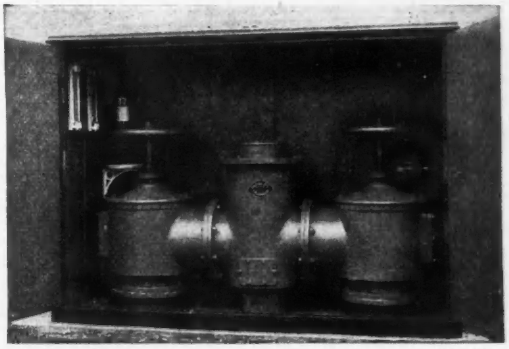

Fig. 321.

Reduction of high pressure to low pressure may be brought about by using Peebles' Mercurial or Diaphragm Governors. These are simple in construction, with double-balanced valves, metal-to-metal or with leather seatings as desired, and with valves and valve seats which can be withdrawn through the top of the governor.

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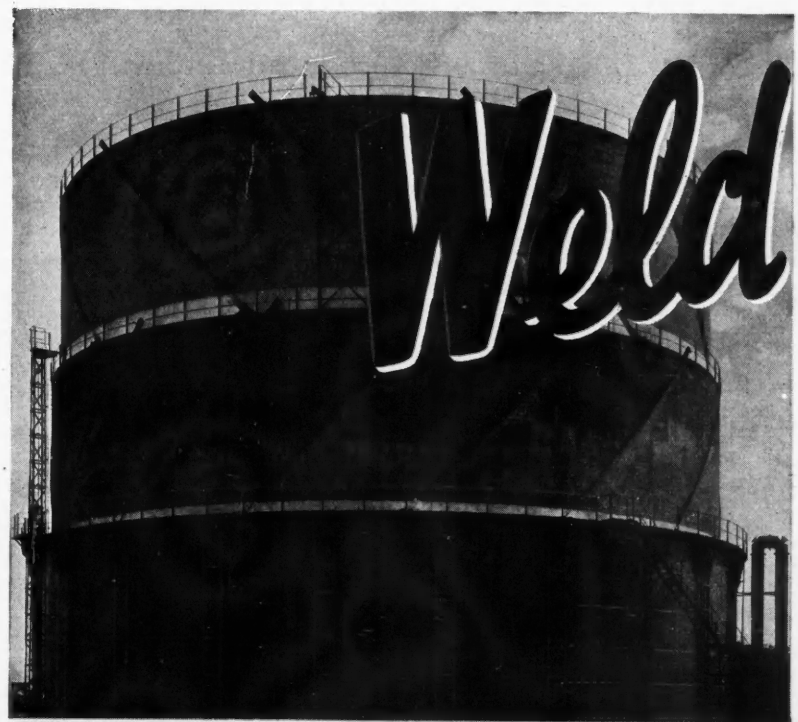

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Oil used per 1,000 cu.ft.	1·57	galls.
Dry coke charged into generator per 1,000 cu.ft.	29·2	lbs.
Carbon consumed in generator per 1,000 cu.ft.	25·47	lbs.

This 25·47 lbs. of carbon per 1,000 cu.ft. also produced automatically 72·0 lbs. of steam (from and at 212° F.) for use in the plant, and gasified 1·57 gallons of oil.

The above results, obtained when gasifying coke containing 84·5% fixed carbon, correspond to the following thermal yields* from the raw materials :—

1·30 therms as oil gas from each gallon of oil gasified, in addition to residual oil-tar—about 15% of the oil used.

86·6 therms as blue-gas from each 1,000 lbs. of dry coke, in addition to production of the above waste-heat steam and the gasification of the oil.

*Computed by the method described in Proceedings of The Institution of Gas Engineers, 1927-8, p. 526.

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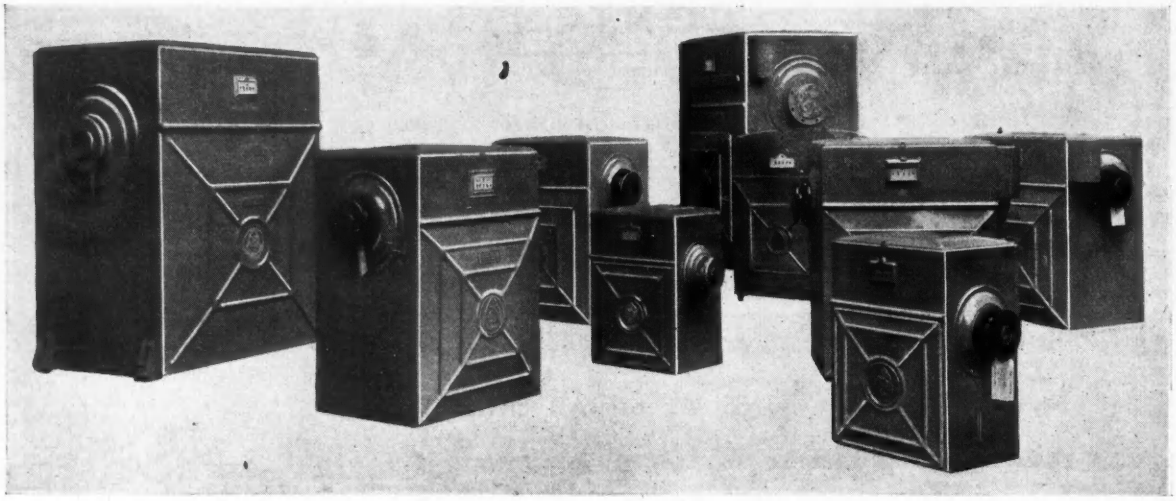

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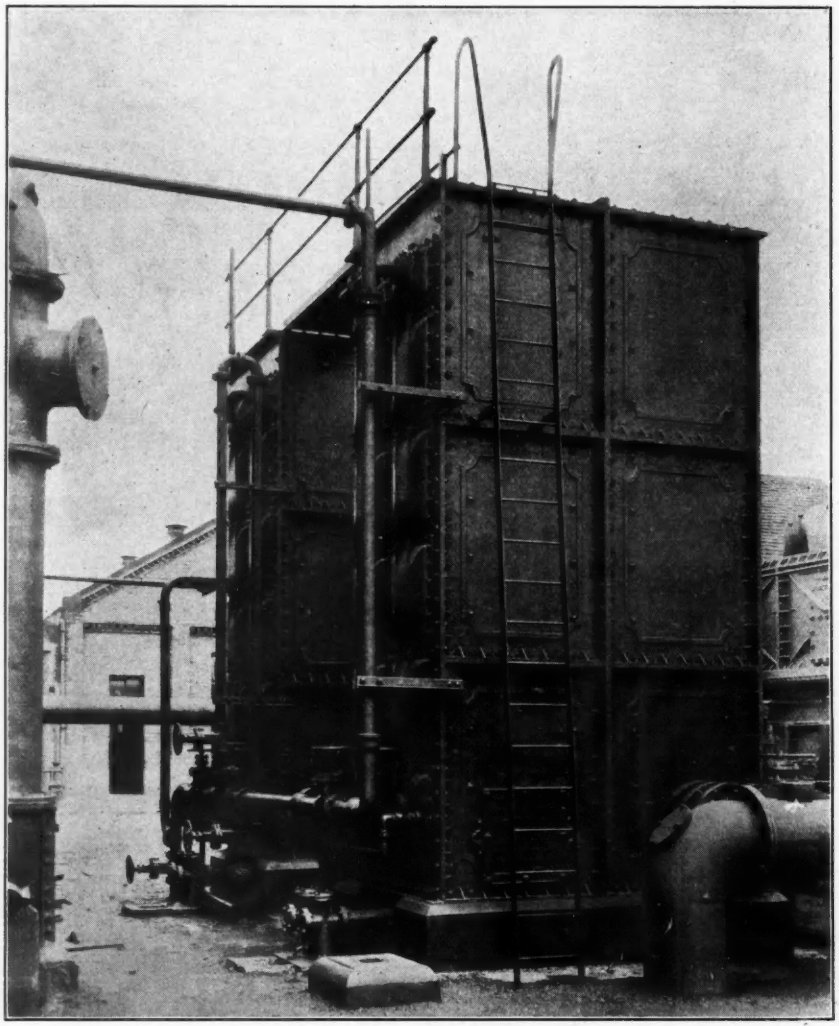

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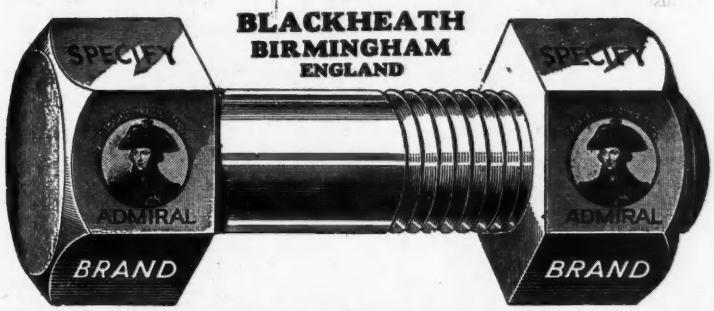

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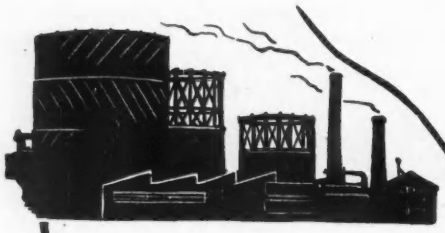

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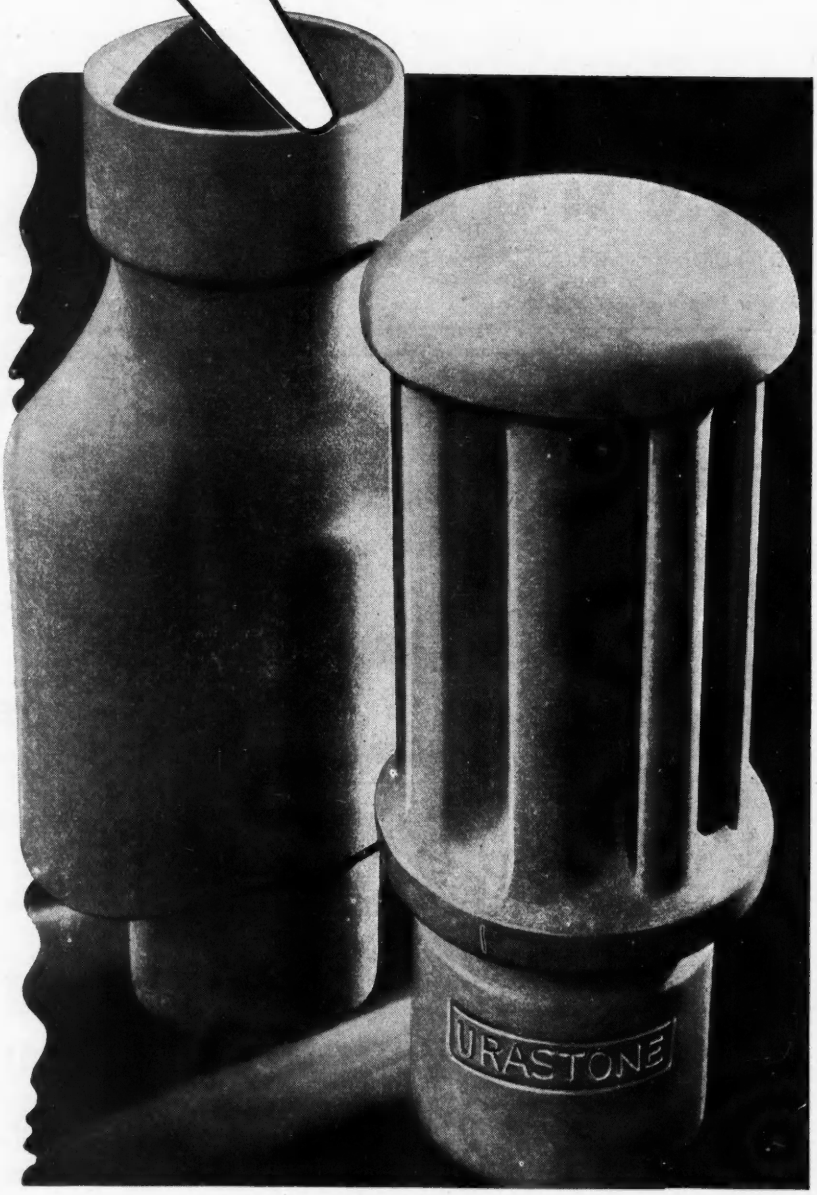

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By Order,

Chief Office, Horseferry Road, Westminster, S.W. 1. BRIAN WOOD, Secretary.

June 18, 1941.

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J. H. WAINWRIGHT,
Engineer, Manager and Secretary.

Gas Offices,
Halesowen,
Worcs.
June 17, 1941.

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Apply, stating Age and Experience to Engineer and Manager, Gas Department, 324, High Street, West Bromwich.
June 16, 1941.

PENRITH URBAN DISTRICT COUNCIL

(GAS DEPARTMENT)

APPLICATIONS are invited from persons not liable for military service for the post of TECHNICAL ASSISTANT in the Council's Gas Undertaking to act under the direction of the Council's Gas Engineer at a salary of £250 per annum. Preference will be given to applicants having experience of horizontal retorts, carburetted water gas and benzole recovery, and with some drawing office experience.

Applications, stating Age, Qualifications and Experience should be sent to the undersigned not later than July 3, 1941, together with the names of two persons to whom reference can be made.

C. H. HUNTLEY,
Clerk to the Council.

Town Hall,
Penrith.
June 11, 1941.

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Apply (before July 5), stating Age, Experience, Qualifications and Salary required to F. G. Brockway, Gas Offices, 421, Grimsby Road, Cleethorpes, Lincs.

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MESSRS. West's Gas Improvement Company require the services of one or two junior TECHNICAL ASSISTANTS for their outside staff. Applicants should be Reserved and have experience of the operation of Gas-Works Carbonizing Plant and the duties of a Clerk of Works. Salary according to Age, Experience and Professional Qualifications.

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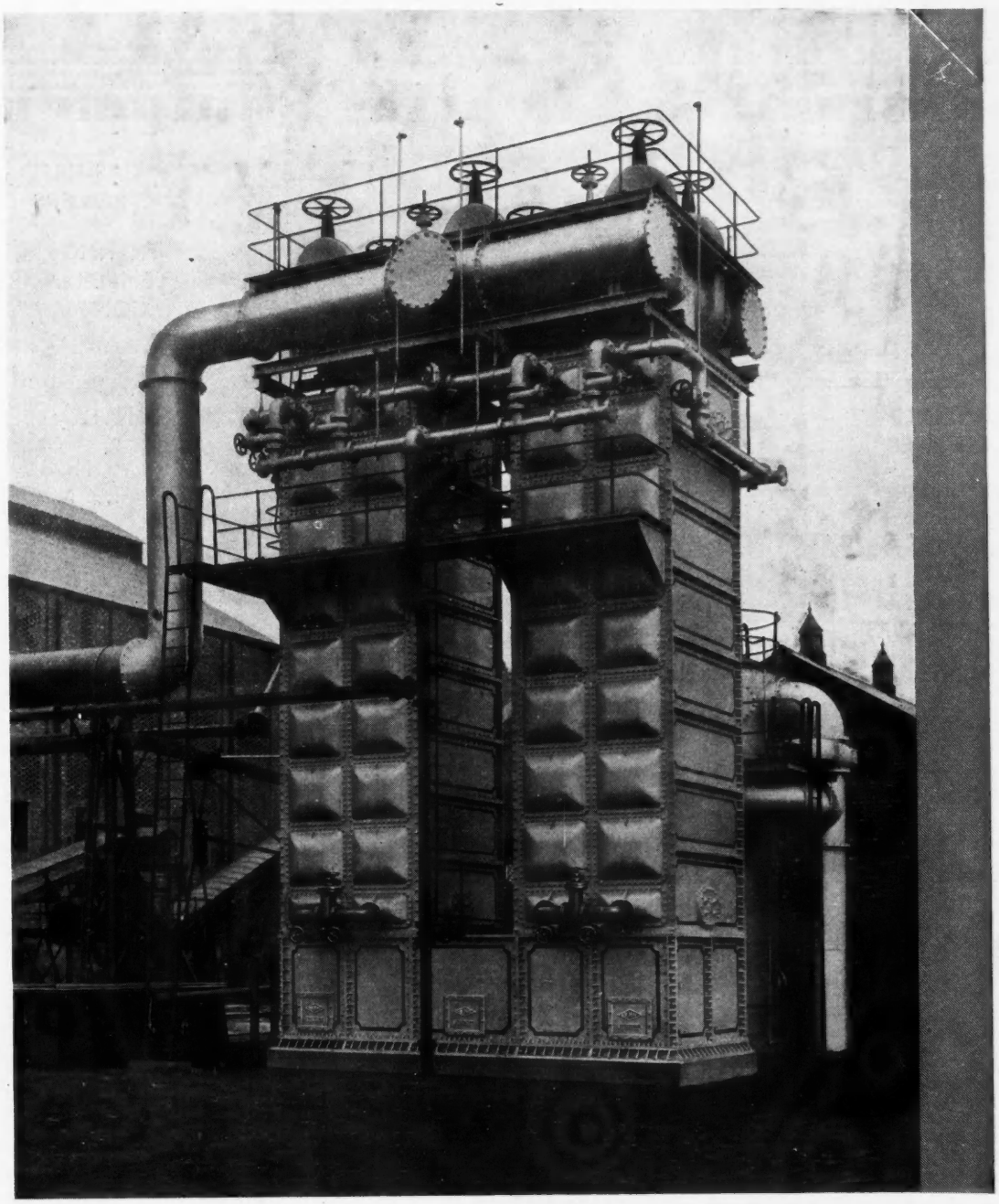

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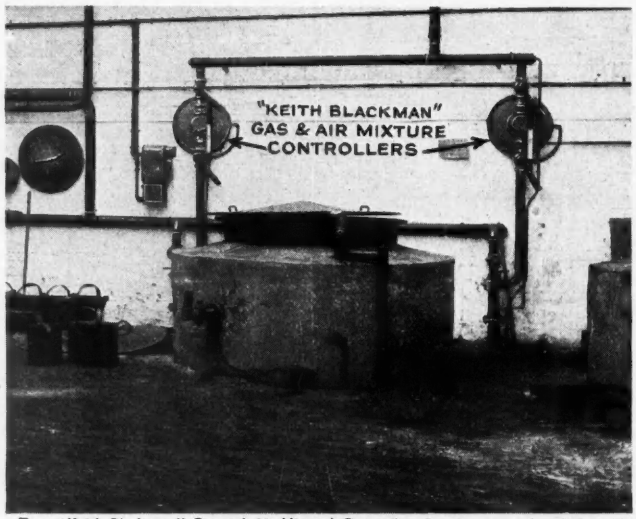

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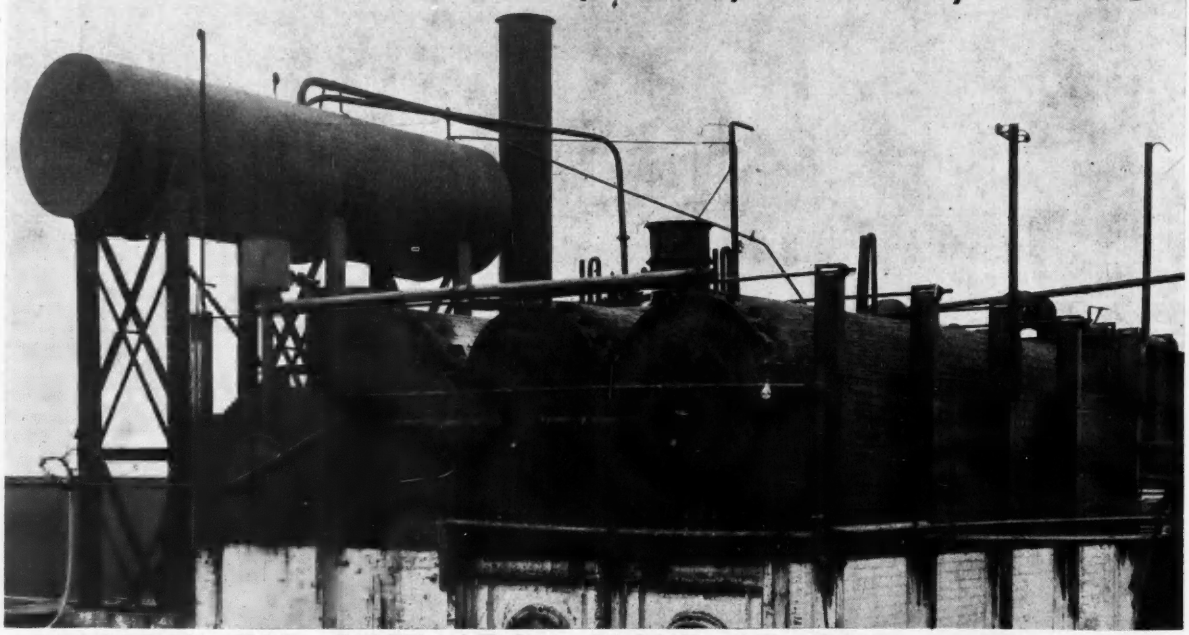

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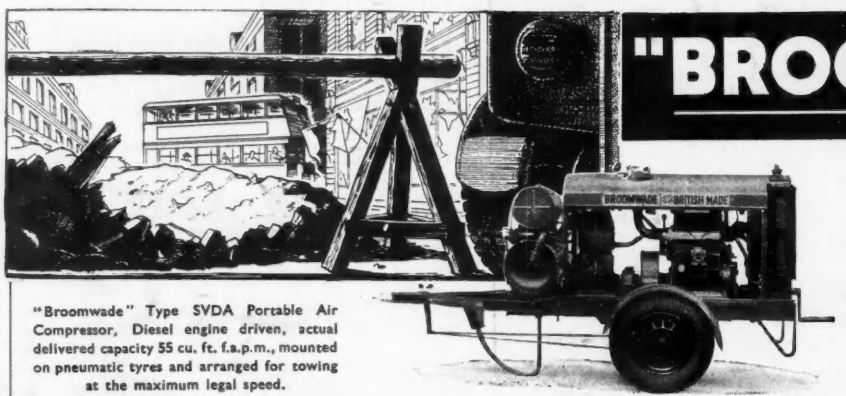

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